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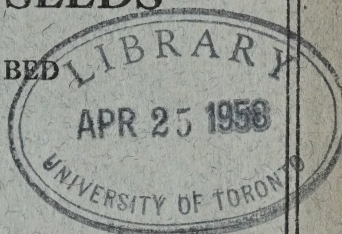
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WEEDS AND WEED SEEDS

ILLUSTRATED AND DESCRIBED



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THE SEED BRANCH

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WEEDS AND WEED SEEDS

Illustrated and Described

The greatest difficulty in the way of producing a more abundant supply of clean clover and grass seed, as well as seed grain, is the prevalence of weeds. In order to produce high class clean seed, farmers must be constantly on the alert to keep the weeds on their farms in check and prevent the introduction and spread of new varieties. In various ways weeds lower the yield, depreciate the quality and value of crops, and add to the cost of production. They rob the soil of plant food and of moisture, thus increasing the effects of drought by taking up water from the soil and wasting it by evaporation; they crowd out more useful plants, being hardier, and, as a rule, more prolific; they increase the cost of every farm operation and cause depreciation in the market value of crops because of the presence of weeds in hay or of weed seeds in grain; the eradication of the worst weeds is costly in labour, time and machinery, and frequently prevents a farmer from following the best crop rotation or from growing the most advantageous crops; many weeds are conspicuous and all are unsightly on farms, and thus depreciate the value of land; some weeds are harmful to stock, while others are injurious to their products; weeds attract injurious insects and harbour fungus diseases.

New weeds are introduced on farms with grass, clover or other commercial seeds, and commercial feeding stuffs, which often contain vital weed seeds. They are spread from district to district through various transportation facilities, such as railways, and become disseminated within a locality in stable manure from towns and cities, and through threshing machines and farm implements. The wind carries some weed seeds long distances, not only in summer but with drifting soil and over the surface of the snow in winter. Streams distribute them along their courses. They are also distributed by herbivorous animals, through the stomachs of which the seeds pass undigested; or they attach themselves by special contrivances, such as hooked and barbed hairs, spines, gummy excretions, etc., to passing animals.

Classification and Eradication

Weeds are classified according to the length of time they live, as annuals or one-year plants; biennials, or two-year plants; and perennials, or many-year plants. In eradicating weeds it is of the greatest importance to ascertain under which of these heads they come.

ANNUALS

Annuals complete their growth in a year. As a rule, they have small fibrous roots and produce a large quantity of seed. Some weeds, called winter annuals, are true annuals when the seeds germinate in the spring, but they are also biennial in habit; that is, their seeds ripen in the summer, fall to the ground, germinate and produce a certain growth before winter sets in, and then complete their development next spring. Annuals may be eradicated from land, however badly infested it may be, through any method by which germination is hastened and the young plants destroyed before they produce seed.

BIENNIALS

Biennials require two seasons to complete their growth, the first being spent in collecting and storing up a supply of nourishment which is used the second season in producing flowers and seeds. Biennials must be either ploughed or cut down before they flower. Mowing at short intervals in the second year, so as to prevent the development of new seeds, will clear the land of this class of plants; but a single mowing will only induce them to send out later branches, which, if not cut, will mature many seeds. Where ploughing is impracticable, such plants should be cut off below the crown of the root.

PERENNIALS

Perennials are those plants which continue to grow for many years. They are propagated in several ways, but all produce seeds. Perennials have two distinct modes of growth; some root deeply, while with others the root system is near the surface. The most troublesome are those which extend long underground stems or rootstocks beneath the surface of the ground, as Canada thistle, perennial or field sow thistle, field bindweed and bladder campion. Representatives of the second class or shallow-rooted perennials are pasture sage, yarrow and couch grass. Some perennials extend but slowly from the root by short stems or offsets, but produce a large quantity of seed. Of these, ox-eye daisy, dandelion, goldenrod and yarrow are examples.

Perennials are by far the most troublesome of all weeds and require thorough treatment, and in some instances the cultivation of special crops, to insure their eradication. Imperfect treatment, such as a single ploughing, often does more harm than good, by breaking up the rootstocks and stimulating growth. For shallow-rooted perennials, infested land should be ploughed so lightly that the roots are exposed to the sun to dry up. For deep-rooted perennials, on the other hand, ploughing should be as deep as conveniently possible. The nature of the land must determine the depth of ploughing. In light or gravelly soils shallow ploughing may be preferable as deep ploughing might interfere with the mechanical texture of the soil, which is so important in the storing of moisture.

The rootstocks of some perennial weeds are very persistent. Some sections or cuttings from them will quickly take root when they are distributed by ploughing or cultivation. Where such persistent perennials have become well established, it is usually advisable to adopt the most convenient method of cultivation that will bring the rootstocks to the surface. They should then be gathered and burnt or otherwise destroyed. Most perennial weeds will, however, succumb to continued thorough cultivation that will prevent the growth of leaves.

Plants take in most of their food through their leaves. Perennial plants, which live for many years, have special reservoirs where some of this food, after elaboration, is stored in such receptacles as bulbs, tubers and fleshy rootstocks. The first growth in spring, particularly flowering stems, is produced mainly by drawing on their special store of nourishment. Plants are therefore in their weakest condition when they have largely exhausted their reserve supply of food and have not had time to replenish it. The stage of growth, then, when ploughing will be most effective is when their flowering stems have made full growth but before the seeds, which would be a source of danger, have had time to mature.

Summer Fallowing

The practice of summer-fallowing land, whatever may be said against it, affords the best opportunity to suppress noxious weeds. For lands foul with persistent growing perennials, a thorough summer-fallow will usually be the most effective, and, in the end the least expensive method of bringing the weeds under control.

The amount and nature of the cultivation of a summer-fallow will depend on the habits of the weeds, the kind of soil, and the climatic conditions. In some extreme cases of perennial weeds, it may be advisable to allow the plants to exhaust their reserve vigor by growth until the flowers are formed, then cut and remove the surface growth, plough to the depth of four or five inches, and bring the rootstocks to the surface before they have had time to renew growth. After cutting and removing the surface growth, cultivators may, after several applications, be forced to the bottom of the furrow, thus unearthing the network of rootstocks. Perennial weeds having deep rootstocks may require a second and deep ploughing before all the underground vegetation can be unearthed. If perennials alone are to be dealt with, they may be treated as above directly after an early hay crop.

When the destruction of annual weeds is the chief purpose of cultivation, deep ploughing two or three times during the summer, with surface cultivation each week during June and July, and less frequently later in the season, should secure the germination and destruction of the maximum number of seeds. On account of the soil and climate, one ploughing of summer-fallow is favoured in the Prairie Provinces.

Short Rotation of Crops

To keep farms free from weeds, few methods give such good results as a systematic short rotation of crops, with regular seeding down to grass or clover at short intervals. Weeds are most in evidence in districts where the production of cereal grains predominates and where the systematic alternation of crops is not generally practised. Thorough cultivation with a systematic rotation of crops, combined with the maintenance of as many sheep as can be kept to advantage, is a certain and profitable means of keeping weeds under control.

Seeding to Grass

Lands foul with some kinds of weeds, particularly annuals, may advantageously be seeded to grass for hay or pasture. The cultivation of hoed crops becomes too expensive for labour when the soil is polluted with weed seeds. Grain crops may also be unprofitable because of weeds, and they afford an opportunity for the weeds to increase. Seeding to grass and cutting the hay crops early will prevent most kinds of weeds from ripening more than a relatively small number of seeds, and the number of vital weed seeds in the sub-surface soil will rapidly decrease from year to year. If perennial weeds are also prevalent, it would be well to pasture with sheep and mow the roughage closely each year, before the spring growth has formed seeds.

Farm Implements to Destroy Weeds

The best time to destroy weeds is within two or three days after the first pair of leaves has formed on the seedling plant. In friable soils the "weeder" is a useful implement for that purpose. The "tilting" harrow is also satisfactory for comparatively loose soils and is preferred as a weed destroyer on firm or clayey land. Weeds are irregular in time of germination; consequently it is necessary to apply the weeder or harrow frequently throughout the growing season. Potatoes, or field of corn and cereal grains when sown with a drill, may advantageously be treated with such weed destroyers once or twice before the crop distinctly shows above the ground, and again, with corn and ordinary grain crops, when the plants are three to six inches high. Even relatively heavy harrows ordinarily in use will do little damage to the potatoes, corn or grain plants if the land is not wet, and the loosening of the surface soil benefits the crop in addition to the destruction of the weeds.

For perennial weeds or seedlings that have become well rooted, a cultivator having diamond shaped or other relatively broad shares is needed for hoed crops. The disc is a favoured implement for destroying weeds in a summer-fallow or in preparing a seed bed. When, however, it is desired to unearth and remove the rootstocks of perennial weeds such as couch grass, a narrow-toothed cultivator, that will loosen the soil and bring the underground vegetation to the surface, is preferred to an implement that will cut the rootstocks, the small cuttings of which may be exceedingly persistent in growth.

Weed Seeds in Seed Grain

One of the principal reasons why weeds are not brought under better control on farm lands is because such large numbers of their seeds are put into the soil through lack of care in ordinary farm operations. The use of seed grain that has not been well cleaned is responsible for the introduction of many new weeds and the increase of those already in the land.

In the spring of 1913 an inquiry was conducted by the Seed Branch to ascertain the sources of supply and the quality of the flax and grain used for seed. Samples representing, as accurately as possible, the average seed being used in the districts visited were taken from over 2,000 farmers throughout Canada and forwarded to the Ottawa seed laboratory where they were tested.

According to this inquiry, about 75 per cent of Canadian farmers grow their own seed grain. Most of the grain and flax purchased for seed is secured from neighbouring farmers, but considerable quantities are obtained from grain dealers and seed merchants. The proportion of farmers who do not grow their own seed is largest in the newer parts of the Prairie Provinces and in Quebec, New Brunswick and Nova Scotia. Analysis of the samples collected shows that most of the grain and flax sold for seed contains large numbers of different kinds of weed seeds, and great care should be exercised in selecting and cleaning to prevent the introduction of new weeds. Weed seeds are also prevalent in homegrown seed.

Oats: The extent to which weeds are sown with seed grain is shown by a summary of the tests of the samples collected. Of the 978 samples of oats analyzed, 547, or 56 per cent, contained seeds of weeds classed as noxious under the Seed Control Act, the highest number being 4,838 per pound and the average 76. Weed seeds other than those classed as noxious were found in 860 or 88 per cent of the samples, the largest number being 6,954 per pound and the average 239. With this weed seed content and the rate of seeding reported, weed seeds would be placed on the land sown with oats at an average rate of 44 noxious and 138 other sorts per square rod.

Barley: Of the 408 samples of barley tested, 234, or 57 per cent contained noxious weed seeds, the highest number being 2,539 per pound and the average 53. Other weed seeds were found in 352, or 86 per cent, of the samples, the highest number being 9,968 per pound and the average 445. With this weed seed content and the rate of seeding reported, weed seeds would be placed on the land at an average rate of over 32 noxious and 270 other sorts per square rod.

Spring Wheat: Of the 506 samples of spring wheat tested, 271, or nearly 54 per cent, contained noxious weed seeds, the highest number being 11,528 per pound and the average 79. Other weed seeds were found in 454, or nearly 90 per cent of the samples, the largest number being 17,415 per pound and the average 343 per pound. With this weed seed content and the rate of seeding reported, the weed seeds placed on the land would average about 50 noxious and 220 other sorts per square rod.

Fall Wheat: With fall wheat the impurities were not nearly so high. Only 29 samples were collected, all from Ontario and mostly from the eastern part of the province. Thirty-seven per cent of these contained noxious weed seeds, the highest number being 176 per pound and the average nine; 76 per cent contained other weed seeds, the largest number being 187 and the average 68 per pound.

Flax: Weed seeds were especially prevalent in the flax samples. Out of 144 tested, 127, or 88 per cent, contained noxious weed seeds, the largest number per pound being 15,424 and the average 662. Other weed seeds were present in all but seven samples, the highest number being 13,984 per pound and the average 4,087. With this weed seed content and the rate of seeding reported, the weeds placed on the land through sowing flax would average 136 noxious and 840 other sorts per square rod.

Some of these weed seeds are difficult to separate, but most of them could be removed by a fanning-mill properly equipped and well operated. The lack of cleaning is indicated by the fact that nearly 11 per cent of the lots of wheat, oats, barley and flax were being sown direct from the thresher, with no cleaning whatever. Over 88 per cent were reported as having been cleaned with a fanning mill, but the samples showed that either the mills were not equipped with the proper sieves or else that they were not well operated. In a few cases samples were taken from lots that were to be cleaned before sowing, so that the figures given above are inaccurate to the extent to which weed seeds were removed from these lots by cleaning. However, comparison of these uncleaned samples with those which had been passed through a fanning mill indicates that little improvement would be effected.

Weed Seeds in Grasses and Clover

Except within limited areas, most farmers in Canada purchase grass and clover seeds. There is more danger of new weeds being introduced with these seeds than with seed grain, which is more generally home grown. In ordinary years Ontario produces all the alsike and red clover seed required for Canada and large quantities are exported, especially of the former. Timothy seed is grown to some extent in many parts of Canada but a large proportion is imported from the United States. Little alfalfa seed is grown in Canada. Most of our imported supply comes from the United States and Russian Turkestan. The following lists contain the names of the weed seeds most frequently present in alfalfa, clover and timothy.

Alfalfa Seed.—*Noxious*. Ribgrass, ragweed, docks, chicory, wild mustard, dodder, wild carrot,ampions, field bindweed. *Others*. Green foxtail, lamb's quarters, sweet clover, pale plantain, Russian knapweed, yellow foxtail, rocket, barnyard grass, black medick, Russian thistle, maple-leaved goosefoot, smartweed, lady's thumb.

Red Clover Seed.—*Noxious*. Ribgrass, docks, ragweed,ampions, Canada thistle, stickseed, wild carrot, wild mustard, false flax. *Others*. Green foxtail, lamb's quarters, pale plantain, black medick, lady's thumb, sheep sorrel, yellow foxtail, sweet clover, plantain, mayweed, barnyard grass, knotweed, crabgrass, witchgrass, catnip, cut-leaved geranium, Russian thistle, heal-all, bedstraw, black bindweed, pigweed, blue vervain, smartweed, field peppergrass.

Alsike.—*Noxious*. Campions, docks, ribgrass, false flax, Canada thistle, ox-eye daisy, stinkweed, wild mustard. *Others*. Black medick, sheep sorrel, lamb's quarters, chickweed, plantain, green foxtail, mayweed, worm-seed mustard, pale plantain, cinquefoil, heal-all, shepherd's purse, catnip, old witch grass, common peppergrass.

Timothy Seed.—*Noxious*. Canada thistle,ampions, ox-eye daisy, ribgrass, docks, false flax, chicory, sow thistle, wild mustard. *Others*. Cinquefoil, sheep sorrel, plantain, lamb's quarters, chickweed, worm-seed mustard, pale plantain, peppergrass, green foxtail, mayweed, heal-all, witchgrass, evening primrose, shepherd's purse, yarrow.

In buying grass and clover seed, it is well to remember that Extra No. 1, which contains no noxious weed seeds and not more than 30 other sorts per ounce, when sown at the rate of 12 pounds per acre will place about 36 weed

seeds on every square rod sown, whereas No. 3 seed, containing the maximum number of weed seeds (80 noxious and a total of 400 per ounce), sown at the same rate, will place about 480 weed seeds, nearly 100 of which may be noxious, on every square rod.

Samples of timothy and clover seed containing more than 10,000 weed seeds per ounce are sometimes received at the seed laboratory. In many cases proper sieves will remove most of the weed seeds and so prevent their return to the land at the rate of several thousand to every square rod.

Weed Seeds in Commercial Grain

Ordinary commercial grades of grain that have passed through terminal elevators contain large numbers and many kinds of weed seeds. This is due to the fact that in handling grain at terminal elevators, cars containing many noxious and other weed seeds are mixed with clean grain of the same grade, thus contaminating the whole bin or bulk lot. On account of this, such grain coming out of the terminal elevators is unfit for seeding; most of it is so foul with weed seeds as to constitute a dangerous source of noxious weeds unless carefully handled. Analysis of five samples of No. 2 Canada Western oats, taken from shipments from five terminal elevators at Fort William, showed the oats to average 313 noxious weed seeds per pound, including nine species, and a much larger variety and number of other weed seeds.

In transportation many seeds are scattered along the right of way of the railroad and thus introduce weeds into new localities.

The danger of spreading weeds through feeding dirty grain to horses and other stock is not sufficiently realized. A farmer who feeds his horses oats containing wild oats and mustards will later find these plants growing in patches all over his field, wherever the horses' droppings have fallen.

Large numbers of weed seeds are put on the land with manure. Many seeds pass uninjured through the digestive tract of farm animals, while others become mixed with the manure and offal from the stables through handling grain and other feeds. When manure is piled and allowed to "heat," the vitality of most of the weeds is destroyed; but when drawn to the field from the stable, or not left long enough in the pile to become well rotted, manure is one of the most important means of weed dispersal. It is especially dangerous when secured from town or city stable, where dirty grain or hay is fed. Grain contaminated with weed seeds should not be brought on a farm even for feed until it has been crushed or ground so as to destroy the vitality of the weed seeds.

Weed Seeds in Screenings

Most of the western wheat and flax and some of the oats and barley entering the terminal elevators at Fort William and Port Arthur passes through the cleaners before it is re-shipped eastward by lake or rail. The screenings thus obtained approximate 100,000 tons annually. This material is made up of broken and shrunken kernels of wheat, oats, barley and flax as well as varying proportions of a large number of weed seeds. Elevator screenings vary widely in composition, depending on the kind of grain cleaned, place of growth and season or climatic conditions. A sample which is believed to have been quite representative of the material screened from the 1913 crop was made up as follows: Broken and shrunken wheat, oats, barley and flax, 40.7 per cent; wild oats, 2.8 per cent; wild buckwheat, 11.7 per cent; lamb's quarter's 20.2 per cent; cruciferous seeds including wild mustard, hare's ear mustard, tumbling mustard, ball mustard, stinkweed, common peppergrass, false flax and wall-flower, 4.3 per cent; other seeds, 2.2 per cent and chaff, 18.1 per cent. Besides those mentioned above the seeds occasionally found in elevator screenings which are classed as "other seeds" in an analysis like the above include: *Panicum*

capillare, *Setaria viridis*, *Phleum pratense*, *Lolium temulentum*, *Agropyron tenerum*, *Hordeum jubatum*, *Rumex* sp, *Axyris amarantoides*, *Amaranthus retroflexus*, *Amaranthus graecizans*, *Agrostemma Githago*, *Silene noctiflora*, *Saponaria Vaccaria*, *Cleome serrulata*, *Rosa pratincola*, *Trifolium hybridum*, *Astragalus caryocarpus*, *Hedysarum boreale*, *Oenothera biennis*, *Gaura coccinea*, *Gilia linearis*, *Lappula echinata*, *Agastache Foeniculum*, *Dracocephalum parviflorum*, *Stachys palustris*, *Plantago major*, *Plantago Rugelii*, *Symphoricarpos occidentalis*, *Grindelia squarrosa*, *Iva axillaris*, *Iva xanthifolia*, *Ambrosia trifida*, *Rudbeckia laciniata*, *Helianthus scaberrimus*, *Helianthus Maximiliani*, *Coreopsis tinctoria*, *Achillea Millefolium*, *Artemisia biennis*, *Cirsium undulatum*, *Cirsium arvense*, *Sonchus arvensis*, *Lactuca pulchella*.

Weed Seeds in Feed Made from Screenings

About 60 per cent of the material composing elevator screenings has been shown to be excellent feed. The remaining 40 per cent made up of small seeds such as lamb's quarters and various mustards often render feed in which they occur disagreeable in taste and sometimes injurious to the health of stock.

Recleaned Screenings with Inspection Certificate is sold by elevator companies and has given satisfaction as feed when the cleaning has been thoroughly done so as to remove all of the small seeds including the various mustards. The composition of these recleaned screenings varies with the season and the thoroughness of the recleanings but the average sample contains approximately the following: cracked and thin wheat, 35 to 50 per cent; wild buckwheat, 25 to 50 per cent, oats and barley, 1 to 5 per cent; flax, 1 to 5 per cent; wild oats, $2\frac{1}{2}$ to 10 per cent; mustards, $\frac{1}{2}$ to 4 per cent; other seeds, 2 per cent; chaff, 2 to 20 per cent. The percentage of mustards, other seeds and chaff should be kept as small as possible. When grain or screenings is not properly recleaned before it is ground to make feed, the vitality of many of the small weed seeds is not destroyed. The impossibility of pulverizing all of the seeds when the entire screenings are ground up together by an ordinary chopper is well illustrated by the analysis of a sample that had been ground with the idea of putting it on the market as a feed. One-eighth ounce contained, lamb's quarters, 260; tumbling mustard, 215; false flax, 8; cinquefoil, 7; green foxtail, 6; wild mustard, 2; hare's-ear mustard, 2; stinkweed, 2; other sorts, 15. This is equivalent to more than 90,000 weed seeds per pound.

Weed Seeds in Mill Feeds

The screenings which are separated from wheat in the large flour mills are usually ground or pulverized by special machinery and mixed with bran and shorts. Many of the mills do the grinding so carefully that their bran and shorts contain few, if any, vital weed seeds. But many weed seeds are to be found in the by-product feeds from some mills.

In the spring of 1913 the seed laboratory examined 396 samples of bran, shorts and chopped feed which had been collected throughout Canada by the inspectors of the Department of Inland Revenue. Analysis showed that 140 of these samples contained noxious weed seeds, the average number being 57 per pound. Twenty-four of the samples contained more than 100 noxious weed seeds per pound, and one sample of chopped feed held 1,104 seeds of wild oats, stickseed, catchfly and stinkweed per pound. Only 144 samples were free from vital weed seeds of any kind. The following seeds were most common:

Noxious.—Wild oats in 74 samples; wild mustard, 30; hare's-ear mustard, 27; false flax, 25; stinkweed, 24; ball mustard, 23; catchfly, 21; docks, 8; ragweed, 6; Canada thistle, 5; stickseed, 5; western false flax, 5; tumbling mustard, 3.

Other Weed Seeds.—Lamb's quarters, 180; wild buckwheat, 94; green foxtail, 11; lady's thumb, 9; chess, 9; American dragonhead, 7; worm-seed mustard, 7.

Danger of Spreading Weeds through Seeds in Feeds

The presence of vital seeds in feeding stuffs is objectionable because many weed seeds retain their vitality after they have passed through the digestive tract of domestic animals.

In an experiment at the Maryland Experiment Station* twenty-two kinds of seeds were fed to animals and the manure spread over sterile soil. It was found that only one kind of seed, Spanish needles (*Bidens bipinnata*) failed to germinate. Docks, ragweed, purple cockle, tumbling mustard and pepper-grass, were all capable of germination.

In another experiment† a cow and horse were each fed two pounds of the unground grain screenings with middlings, bran and wheat straw, each morning and night for seven days. On the evening of the seventh day the animals were bedded with sawdust and the dung of one night collected. The sawdust and dung were thoroughly mixed and put in boxes and set on a bench in the greenhouse. The dung was collected on May 24. On June 21, the following weeds had grown:

Cow Dung—

149 Lamb's quarters.
12 Pigweed.
14 Bindweed.
4 Foxtail.
2 Timothy.

Horse Dung—

1,213 Lamb's quarters.
28 Foxtail.
11 Pigweed.
12 Bindweed.
6 Timothy.
3 Clover.
2 Morning glory.
5 Mustard.

Poisonous or Deleterious Effects of Certain Weed Seeds

Investigation has shown that many of the complaints made by live-stock men in regard to the injury to the health of animals caused by certain feeding stuffs is due to the presence of poisonous or otherwise injurious weed seeds included in the feed. Sometimes animals refuse to eat feeds and the trouble is often traceable to the presence of seeds which are bitter or otherwise disagreeable in taste. Comparatively little work has been done in this connection but the following seeds are authoritatively stated to be poisonous: *Brassica arvensis*, *Brassica nigra*, *Erysimum cheiranthoides*, *Thlaspi arvense*, *Sisymbrium altissimum*, and *Camelina sativa*. The following are also objectionable in feed on account of injurious properties or disagreeable taste: *Agrostemma Githago*, *Lolium temulentum*, *Saponaria Vaccaria*, *Lappula echinata*, and ergotized grains.

Weed Seeds in Farm Lands

It is important to consider not only the large number of weed seeds sown with improperly cleaned grain but also those already in farm soils. Some of our worst weeds are so prolific in the production of seeds that relatively clean fields may be badly contaminated in two or three years if these weeds are allowed to go to seed. For instance, a single plant of wild mustard, stinkweed, foxtail, pigweed or campion produces from 10,000 to 20,000 seeds, worm-seed mustard about 25,000, shepherd's purse about 50,000 and tumbling mustard about 1,500,000. With such productiveness, soils become quickly infested with weed seeds, although on account of their inconspicuousness the presence of the seeds is not fully realized. Only a careful examination will reveal their kinds and numbers.

* Bull. 128, Maryland Agri. Exp. Station "The Effect of Animal Digestion and Fermentation on the Vitality of Seeds." 1908.

† Bull. 168, Maryland Agri. Exp. Station "By-Product Feeds." 1912.

In the spring of 1914 the Seed Branch gathered some data on the prevalence of weed seeds in farm lands. Fields were selected in Alberta, Saskatchewan, Ontario and Quebec, records of their culture and cropping were obtained, and samples of soil at different depths and in different parts of each field were taken and examined at the Ottawa seed laboratory. In the four provinces 74 fields were selected from which 573 samples were taken, 191 from the surface, 191 from a depth of 2-3 inches and 191 at from 5-7 inches. From a definite weight of the air dried soil of each sample, the weed seeds were separated out, identified and counted.

To convey some idea of the prevalence of weed seeds in these samples, four typical fields under different conditions have been chosen and the seeds found in them are tabulated below. At Lacombe, Alta., a field was examined which had grown oats and barley regularly without summer fallow from 1904 to 1912. It was nearly always fall ploughed but was harrowed before ploughing to sprout the weed seeds. In 1913 it was seeded to timothy and alsike. The following is a list of the numbers and kinds of weed seeds found in samples from this field.

Seeds found in 6 oz. of surface soil	Seeds found in 6 oz. of soil taken 2 to 3 inches deep	Seeds found in 6 oz. of soil taken 5 to 7 inches deep.
Ball mustard..... 51	Ball mustard..... 59	Ball mustard..... 39
Lamb's quarters..... 78	Lamb's quarters..... 70	Lamb's quarters..... 69
Black bindweed..... 4	Black bindweed..... 2	Black bindweed..... 2
Grass..... 1	Sedge..... 1	Other sorts..... 2
	Other sorts..... 1	
Total.....134	Total.....133	Total..... 112

It is noticeable that the prevalence of weed seeds is nearly the same at all three depths.

Six ounces of air-dried soil has an approximate volume of 8.58 cubic inches, and from the above figures it may be calculated that a square yard of the surface inch of this field contains about 20,240 weed seeds.

Near Brantford, Ont., samples were taken from a field which had been in sod for six years, having either grown a crop of hay or been pastured each year during that time. The following weed seeds were found in these samples.

Seeds in 6 oz. of surface soil	Seeds in 6 oz. of soil 2 to 3 inches deep	Seeds in 6 oz. of soil 5 to 7 inches deep
Ragweed..... 9	Black bindweed..... 17	Black bindweed..... 11
Black bindweed..... 67	Green foxtail..... 1	Lady's thumb..... 5
Green foxtail..... 20	Lady's thumb..... 8	Crabgrass..... 4
Lady's thumb..... 14	Crabgrass..... 22	Lamb's quarters..... 7
Crabgrass..... 11	Lamb's quarters..... 9	Old witch grass..... 1
Sheep sorrel..... 2	Sleepy catchfly..... 1	
Yellow foxtail..... 3	Knotweed..... 1	
Lamb's quarters..... 1		
Total.....127	Total..... 59	Total..... 28

In this field the number of weed seeds in the surface inch greatly exceeds the number at either of the two lower depths. A square yard of the surface inch of this field contains about 19,183 weed seeds.

Samples were taken from a field near Guelph, Ont., which for the last ten years has raised the following crops: 1905, meadow; 1906, corn (field was fall ploughed in 1905); 1907, oats; 1908, bare fallow; 1909, winter wheat seeded with timothy and clover; 1910, pasture; 1911, ploughed in early summer, seeded with millet and thoroughly cultivated after millet was removed (this treatment was owing to the prevalence of white cockle); 1912, barley seeded with alfalfa; 1913 and 1914, alfalfa. The following weed seeds were found in samples from this field.

Weed seeds in 6 oz. of surface soil		Weed seeds in 6 oz. of soil 2 to 3 inches deep		Weed seeds in 6 oz. of soil at 5 to 7 inches deep	
White cockle.....	9	White cockle.....	6	White cockle.....	6
Black medick.....	10	Black medick.....	8	Black medick.....	6
Lamb's quarters.....	7	Lamb's quarters.....	5	Lamb's quarters.....	8
Black bindweed.....	4	Black bindweed.....	1		
Dandelion.....	2				
Canada thistle.....	1				
Total.....	33	Total.....	20	Total.....	20

The prevalence of weed seeds at the three depths in this field is practically constant, while a square yard of the surface inch contains about 4,984 weed seeds. It is significant that this field, which has been under a good system of cultivation, contains only about a quarter as many weed seeds as either of the two other fields mentioned.

Examination of samples taken from a spot along a road fence at Rouleau, Sask., shows how seeds may be spread by the wind. Weeds had been blown across a prairie field and lodged against the fence. The following seeds were found in the samples taken.

Weed seeds in 6 oz. of surface soil		Weed seeds in 6 oz. of soil 2 to 3 inches deep		Weed seeds in 6 oz. of soil 5 to 7 inches deep	
Stickseed.....	330	Stickseed.....	3	Lamb's quarters.....	6
Wild mustard.....	267	Black bindweed.....	6		
Hare's-ear mustard.....	99	Chickweed.....	3		
Stinkweed.....	3				
Black bindweed.....	159				
Lamb's quarters.....	15				
Rye grass.....	12				
Pigweed.....	9				
Milk spurge.....	9				
Wall-flower.....	3				
Total.....	906	Total.....	12	Total.....	6

These results indicate that a large number of weed seeds of many kinds had been carried to this spot and show that the wind is an important factor in spreading weeds, especially on the prairie.

Germination of Weed Seeds

The seeds of most annual weeds, when embedded in the soil, retain their vitality for several years. The seeds of the Mustard family and others, when ploughed down soon after ripening, seldom germinate the following year or until they are brought by further cultivation near the surface. Light surface cultivation during the early autumn usually serves to stimulate germination in freshly ripened weed seeds and a considerable proportion of them may thus be destroyed, whereas by deep ploughing the difficulty is simply deferred to succeeding years.

The germination of weed as well as other seeds is affected by heat. Many kinds of weed seeds, such as some of the grasses and mustards, will germinate in the late autumn or early spring when the soil is quite cold. Others, such as wild buckwheat and lamb's quarters, require a warmer soil, and the seeds of foxtail and purslane continue dormant until stimulated by the heat of summer. Late autumn or early spring cultivation is not effective in destroying the seeds of weeds that will not germinate unless the soil is quite warm.

Distribution from Weed Patches

Patches of perennial weeds, such as field sow thistle, field bindweed, Canada thistle and couch grass, should receive prompt attention. The roots are commonly distributed by farm implements used for cultivating and new patches are established from broken roots that have been dragged along by the plough or other implement. Any method of cultivation that may be effectively employed to unearth and destroy the underground stems and fleshy roots of perennials should be used when patches of them are first observed. Patches of field bindweed and sow thistles may be smothered by covering them for a year with straw or farmyard manure.

Hand Weeding Seed Crops

Even with the greatest care and the best cultivation some weeds are almost sure to appear in clover and grain intended for seed and the only practical means of handling them successfully is hand pulling or spudding. With clover seed crops especially it is essential that the fields be carefully gone over and the weeds removed or destroyed before they go to seed. Failure to do this often results in the production of clover seed that is badly contaminated with weed seeds and its market value is thereby greatly reduced or entirely destroyed.

Making Weed Seed Collections in Schools

No subject in agriculture is better adapted for presentation to school children than the study of seeds. The collection, identification and study of seeds give scope for the training of a wide range of faculties and the intrinsic value of the information so derived is of real value to any one engaged in crop production. It is, therefore, advisable that those responsible for directing children in collecting and studying seeds should understand the seeds it is most important to know, and their relationship to the different branches of crop production.

Unfortunately, it is not difficult to make a fairly large and representative collection of weed seeds in almost any district in Canada. There are a number of weeds which occur practically everywhere. On the other hand, a great many are associated with certain crops, or with certain types of soil, or are limited to particular sections of the country. The weed seeds which may be found in almost any district include lamb's quarters (*Chenopodium album* L.), wild buckwheat (*Polygonum Convolvulus* L.), wild oats (*Avena fatua* L.), and wild mustard (*Brassica arvensis* (L) Ktze).

IMPURITIES OF GRAIN

The following list includes the most characteristic impurities of grain grown in different parts of the country. It should be possible to secure all of the seeds here listed in any school section in the province or district indicated. It will be noticed that most of these weeds are annuals:—

- *Wild buckwheat.
- *Lamb's quarters.
- *Wild mustard.
- Wild oats—very common except in Prince Edward Island.
- †Ball mustard (*Neslia paniculata* (L.) Desv.)
- †Stickseed (*Lappula echinata* Gilibert).
- †Western false flax (*Camelina sativa* (L.) Crantz).
- †Hare's-ear mustard (*Conringia orientalis* (L.) Dumort).
- †Stinkweed (*Thalspi arvense* L.)
- †Cow cockle (*Saponaria Vaccaria* L.)
- †Tumbling mustard (*Sisymbrium altissimum* L.)
- Purple cockle (*Agrostemma Githago* L.)—Very common especially in wheat.
- Perennial sow thistle (*Sonchus arvensis* L.)—One of the worst weeds. Its seeds are found to some extent in grain from Eastern Canada and Southern Manitoba.
- Lady's thumb (*Polygonum Persicaria* L.)—One of the commonest impurities of grain except on the prairies.
- Spurrey (*Spergula arvensis* L.)—Characteristic of grain from the Maritime Provinces, Quebec, and British Columbia.

- Hemp nettle (*Galeopsis Tetrahit* L.)—Especially common in Prince Edward Island, Nova Scotia and Quebec.
- Wild vetch (*Vicia angustifolia* (L.) Reichard)—A very common impurity of grain in Ontario and Quebec.
- Chess (*Bromus secalinus* L.)—Very common in Ontario fall wheat.
- Darnel (*Lolium temulentum* L.)—Occurs commonly in Red River Valley and occasionally throughout the Prairie Provinces.
- Great Ragweed (*Ambrosia trifida* L.)—Wheat from some districts of the West often contains considerable quantities of these seeds.
- Chicory (*Cichorium Intybus* L.)—Frequently found in Quebec seed.
- Worm-seed mustard (*Erysimum cheiranthoides* L.)—A very bitter seed that renders chopped feed made from grain containing it very unpalatable to some kinds of stock, especially hogs. Often found in grain and sometimes in timothy seed.

IMPURITIES OF GRASS AND CLOVER SEEDS

Ribgrass or Buckhorn (*Plantago lanceolata* L.), one of the most frequent and injurious impurities of Canadian-grown grass and clover seed; especially common in red clover; difficult to remove by ordinary cleaning machinery.

Green foxtail (*Setaria viridis* (L.) Beauv), very common in red clover seed and difficult to remove.

Night-flowering catchfly (*Silene noctiflora* L.), the commonest impurity of alsike, found also in timothy and red clover.

†Docks (*Rumex* species).

†Canada thistle (*Cirsium arvense* (L.) Scop.

†Sheep sorrel (*Rumex Acetosella* L.)

†Black medick (*Medicago lupulina* L.)

†Pale plantain (*Plantago Rugelii* Dene.)

†Common plantain (*Plantago major* L.)

†Lamb's quarters.

Cinquefoil (*Potentilla monspeliensis* L.), the commonest impurity of timothy seed.

Chickweed (*Stellaria media* (L.) Cyrill), *stitchwort* (*Stellaria graminea* L.) and *mouse-ear chickweed* (*Cerastium vulgatum* L.) occur commonly in timothy and less frequently in alsike.

Peppergrass (*Lepidium apetalum* Willd) common in timothy.

Ox-eye daisy (*Chrysanthemum Leucanthemum* L.), frequently found in Quebec timothy, and not uncommon in Ontario and Prince Edward Island timothy.

*Common impurities of grain everywhere.

†Prevalent on the prairies, and not infrequently found in other parts, especially where low-grade Western grain has been used as seed or fed without being first cleaned and ground.

‡Very frequently found in red clover, alsike and timothy seed, especially in the east.

THE NOXIOUS WEEDS

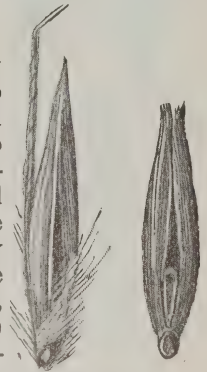
The Seed Control Act, 1911, empowers the Governor in Council to specify the weeds that are to be classed "noxious" within the meaning of the Act. This makes it possible to include any new weeds that may be introduced and become dangerous without amending the Act.

The following are the weeds classed noxious under the 1919 Order in Council. The arrangement is according to botanical order.

Wild Oats (*Avena fatua* L.) Introduced from Europe. Annual, 2 to 6 feet high. Plants closely resemble cultivated oats. Head spreading, usually



nodding; seed-bearing stems very slender, bending with the weight of the seeds, giving the head a drooping appearance. The seeds vary somewhat in size and greatly in colour, from almost black to brown, gray and white. All forms are similar in shape to cultivated oats, but are slimmer and at once distinguished by the stiff twisted awn, the hairs which are particularly prominent at the base, the slanting horseshoe-shaped scar, and the minute stalk (rachilla) supporting the second or "bosom" grain. In Wild Oats this is stout, becoming wider and



terminating at the top in a slanting surface, while in cultivated oats it is thread-like throughout its entire length. In threshed grain many of these distinguishing marks may be broken off but usually some remain.

False Wild Oats, often confused with the above, are a form of cultivated oats. The plants appear to be identical with those of the cultivated variety in which they occur but the seeds resemble those of Wild Oats in having both the long stiff awn and horseshoe-shaped base. They are, however, generally less hairy and stouter and do not differ in size from those of the cultivated variety in which they originate. False Wild Oats germinate readily the fall they ripen while the germination of true Wild Oats is deferred.

Eradication.—It is impossible to clean land of Wild Oats in one or even two seasons, but the following measures will greatly reduce their numbers and if persisted in will clean the land: Fall or spring discing followed by (a) shallow ploughing in early June with deeper ploughing in late July, or (b) ordinary ploughing in June sown to green feed. There is reason to believe that Wild Oats will not retain their vitality in the soil for more than five years. Seeding to grass and leaving in seed for this period should therefore prove effective in destroying them.

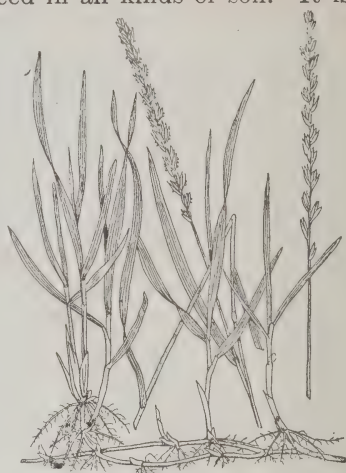
Couch or Quack Grass (*Agropyron repens* (L.) Beauv.) is widely distributed throughout Canada and a most injurious weed in all kinds of soil. It is perennial by wide-spreading but shallow fleshy rootstocks, forming large matted beds. Flowering stems rather freely produced, smooth above, downy below. Flowers in 3 to 7-flowered spikelets, forming a narrow spike with the spikelets lying flat against the stalk. Leaves dark green, rather distinctly ribbed, and more or less hairy below. The seeds are seldom found in cereals, timothy or clover seed but occasionally in the coarser grasses, and in litter from hay or straw containing mature Couch Grass.

Eradication.—To destroy this persistent weed let it exhaust its substance in the production of a hay crop,

which should be cut and removed as soon as the head is formed and before it is in blossom. Plough shallow and cultivate until the rootstocks have been brought to the surface when they should be gathered and removed or burned. This may be followed by a cleaning crop of rape, buckwheat or millet and a hoed crop the next spring.

In the Prairie Provinces shallow ploughing late in June when land is dry followed by back-setting as soon as possible in the fall and a thorough cultivation the following spring, has given good results. Plough shallow after hay crop and unearth rootstocks with successive cultivation before growth is renewed.

Docks (*Rumex* species).—The most common member of this group is **Curled Dock** (*Rumex crispus* L.) shown in the illustration. It is a perennial with a deep tap-root. Stem 2 to 3 feet, smooth, erect, terminating in wandlike racemes. Root-leaves, oblong-lance-shaped in outline with much crested or waved margins, 6 to 12 inches long, on long stalks; stem-leaves on short stalks and much smaller or absent towards the top of the stems. Curled Dock is a common weed in meadows, pastures and waste places throughout Canada, being very abundant in southern and western Ontario. The seeds of the Docks are commonly found in clover seed. They are very similar in appearance, but have the following points of differentiation: Curled Dock seeds, illustrated, $\frac{1}{12}$ of an inch long, shaped like a miniature beech-nut, nearly symmetrical, both ends pointed, widest near the centre, the edges very slightly margined, reddish brown and highly shiny; **Clustered Dock** (*Rumex conglomeratus* Murr.), apex of the seed pointed, base rounded, smaller, plumper, dark reddish brown; **Bitter Dock** (*Rumex obtusifolius* L.), seed unsymmetrical, widest below the centre, edges unmargined, the base with a rough scar, brownish yellow, dull.



Eradication.—Short rotation of crops. Hand pulling.

Russian Thistle (*Salsola Kali* L., var. *tenatifolia* G.F.W. Mey.) is an annual introduced from Asia. It is abundant in several localities in the dryer parts of Alberta and Saskatchewan, chiefly along roadsides, fire-guards and in neglected fields and is frequently found, though not seriously troublesome, in the eastern provinces. Russian Thistle is a large succulent weed and thrives where the land is too dry for other plants. It is bushy, of a prickly appearance, due to the thin, thread-like, prickle-tipped leaves which characterize the young plant, and the short, triple, spiny bracts on the flowering branches of the older plants. It varies in appearance at different stages of growth. The young plant is dark green, the slender leaves, about two inches long, drop off soon after the seed is formed. The some-

what spherical branched top of the mature plant, when broken away from the root, is blown about by the wind and scatters its seeds widely. It is not a thistle and could be more appropriately called a tumble weed. Flowers solitary, borne in the axils of the leaves. The seed is about $\frac{1}{8}$ of an inch in diameter, cone-shaped, the large end concave with a well marked protuberance in the centre of the cavity. The coat is thin and transparent, showing the grayish-brown, coiled germ. The seeds are generally enclosed in a papery envelope, the divisions of which are winglike. They occur quite frequently in imported alfalfa seed.

Eradication.—Badly infested fields should be seeded to grass. Avoid spring cereal crops.

Purple Cockle (*Agrostemma Githago* L.)—Introduced from Europe. Annual and winter annual. Erect, 1 to 3 feet high; branches few; whole plant covered with soft, silky hairs; not viscous. Leaves 2 to 5 inches long, narrow and pointed. Flowers purple, borne at the tips of the stems and branches, $1\frac{1}{2}$ inches across. Fruit capsule ovoid, with 5 teeth at the apex. It occurs in grain fields throughout Canada. The seed is pitchy black, from $\frac{1}{12}$ to $\frac{1}{8}$ of an inch in diameter, somewhat flattened, rounded triangular; the thin edge notched by the scar of attachment; rough, covered with rows of short teeth. It is difficult to separate the seeds from wheat without a heavy loss of grain. When ground with wheat, the seeds give the flour a dark colour and a bad flavour. They are a

very common impurity in seed wheat and are found less frequently in seed oats.

Eradication.—Summer fallow. Hand pulling.

Night-Flowering Catchfly (*Silene noctiflora* L.).

The name of this plant is quite apt. The stems are covered with a sticky substance, by which small insects are often entangled on the stems and leaves. Its few, large, creamy white flowers open at night or during a cloudy day and close when the sun shines. The stem is from one to three feet tall, rather stout, branching.

Catchfly is a very common weed in meadow and grain fields and in hoed crops. It is a rank grower and heavy seeder and is particularly troublesome in clover fields. Its seeds are impossible of separation from alsike except by the use of special machinery, and consequently seed harvested from fields containing much catchfly, must be sold at a very low price. From timothy and red clover its seeds are separated with only a little less difficulty than in the case of alsike. On account of the plant's pungent flavour and woody texture it is objectionable to live stock, whether in pasture or cured fodder, and when at all prevalent in hay a considerable waste results.



The seed is about $\frac{1}{20}$ of an inch in diameter, very slightly flattened, dull grayish-brown, with 8 to 10 curved rows of tubercles on each side.

Eradication.—As the plant is propagated entirely by seeds its suppression is accomplished by preventing it from seeding and by inducing the seeds already in the soil to germinate and then killing the seedlings. Catchfly will not long give trouble on land worked under a short rotation of crops. Its appearance in alsike fields is largely due to its being sown with the clover seeds.

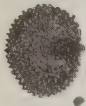
Bladder Champion (*Silene latifolia*, (Mill) Britten and Rendle) and **White Cockle** (*Lychnis alba*, Mill) are near relatives of catchfly.

The seeds of these two plants are not nearly so common in clover and timothy seed, but the plants are much more difficult to eradicate from fields in which they become established. Bladder champion is perennial, with deep-running root stocks and is the most dangerous weed of this group. It has become widely distributed in the eastern provinces during recent years, and has proven to be very difficult to suppress. The whole plant is pale green and in the common form perfectly smooth; stems one foot to eighteen inches high, forming large tufts; leaves in pairs, meeting round the stems; flowers white, nearly an inch across, drooping; calyx much inflated, pale green, veined with bright purple, toothed at the contracted apex.



White cockle is a biennial or short-lived perennial, sparingly distributed in Ontario as yet. The rootstocks are thick, sending up a few short barren shoots and long branching flowering stems, 1 to 2½ feet high. The whole plant is viscous hairy, but not so much so as catchfly. It is wider branching, has many stems, the leaves are larger, the flowers more numerous and pure white.

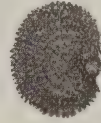
Eradication.—Prevent seed production. Seeding to clovers and grasses gives these plants an opportunity to establish themselves. If the infested ground is in meadow, it should be broken up and a rotation of crops adopted that will allow for deep and thorough cultivation each spring before seeding and again as soon as the crop is removed, as could be given by sowing peas, vetches or other crops to be cut green for fodder, followed by a hoed crop, and the third year cereal grains. Occasional plants in new seeding can be destroyed by applying a handful of salt to the root after cutting in hot, dry weather.



White Cockle.



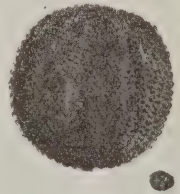
Catchfly.



Bladder Campion.

The seeds of the three plants are very similar in appearance. With catchfly the tubercles with which the surface of the seed is covered are not symmetrically arranged, while with bladder campion and white cockle they are in concentric rows. With white cockle the rows are slightly farther apart than with bladder campion.

Cow Cockle (*Saponaria Vaccaria* L.)—Introduced from southern Europe. Annual. Stem simple, branching above or much branched from the base, 1 to 2½ feet. The whole plant is smooth, succulent and of a grayish-green appearance, like the leaves of a cabbage. Leaves ovate-lance-shaped, clasping the stem. Flowers pale rose-pink, ½-inch across, in loose corymb-like cymes. Calyx ovate, 5-ribbed and much inflated, winged and angled in fruit. The smooth roundish fruit capsules contain about 20 seeds each. A troublesome weed only in the Prairie Provinces. The seed is round, hard, dull black, about ⅙ inch in diameter, and is often confounded with the seeds of wild vetches. It can be distinguished from vetch seeds of a similar size by its minutely roughened surface, or by cutting it open after soaking, when the germ, which lies in a circle around the seed just beneath the seed-coat, will be seen. It in no way resembles the inside of a vetch or pea, which when the seed-coat is removed after soaking, can be easily separated into similar halves. The seeds are a common impurity in commercial wheat and are almost as objectionable to the miller and baker as are those of Purple Cockle.



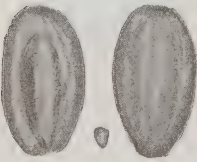
Eradication.—Summer fallow. Hand pull to prevent seeding.

Stinkweed (*Thlaspi arvense* L.) Introduced from Europe. Annual and winter annual. Whole plant bright green and quite smooth. Root leaves borne on foot stalks; stem leaves clasping the stem with the arrow-shaped base. Flowers clear white, $\frac{1}{8}$ of an inch across. Pods flat, $\frac{3}{4}$ -inch across, pale green and winged, notched at the top. Just before the seeds ripen the pods turn a characteristic greenish-orange shade, easily noticed when this weed is growing among crops. Stinkweed is now found in every province in Canada, but nowhere is it such a terrible pest as in the Prairie Provinces where it was introduced with the first settlers. The seed is about $\frac{1}{12}$ of an inch across, a little longer than broad, deep purplish-brown, unsymmetrically oval in outline, flattened, with rounded edges. The flattened surface has 5 or 6 loop-like lines, which start at the basal scar or notch and run concentrically around a central groove. The seeds are frequently found in western grain and grass seeds.



Eradication.—Summer fallow. Disc as soon as the grain crop is removed. Late fall and early spring cultivation. Harrow once or twice when grain is two or three inches high.

Western False Flax (*Camelina sativa* (L.) Crantz).—Introduced from Europe. Annual and winter annual, 2 to 3 feet high, erect, slender, branching near the top. Root-leaves lance-shaped and narrowed into a foot stalk; upper leaves arrow-shaped, sharply pointed. The lower leaves and the lower part of the stem downy with star-shaped hairs. The upper part of the stem smooth and covered with a fine bloom. Flowers numerous, small, $\frac{1}{8}$ -inch across, pale greenish-yellow. Pods $\frac{3}{8}$ -inch long, balloon or pear-shaped, margined and tipped with a slender beak, on slender foot-stalks, curving upward, each containing about 10 seeds. Seeds yellowish-brown, about $\frac{1}{15}$ -inch long. The miniature root of the germ very prominent, lying along the seed. Seed-coat finely pitted. The seed is a very common impurity in flax, especially from Western Canada. It also occurs in Ontario, particularly in fall wheat.



False Flax.



Flat-seeded False Flax (*Camelina dentata* Pers.) was introduced into Manitoba in 1906 with imported flax seed. The seeds vary much in shape and size, being generally larger than those of Western False Flax, irregularly oval or oblong in outline, thickly flattened and pale yellow in colour. The plant may be distinguished by its early leaves, which are broadly dentate. The seed is found chiefly in flax seed.

Eradication.—False flax is propagated entirely by seeds. Prairie soils infested with the weed should receive a thorough discing or shallow ploughing in the spring before seeding. When a crop of winter wheat is infested, harrowing in the spring kills the young plants without injuring the wheat. Badly infested fields should receive a thorough summer-fallow, with cultivation the previous fall.



Flat-seeded
False Flax.

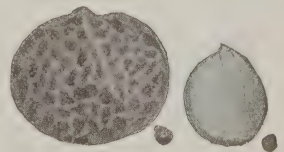
Small-seeded False Flax (*Camelina microcarpa* Andr.) resembles Western False Flax but is more slender and has smaller pods. The seeds are only about $\frac{1}{20}$ of an inch long, dark reddish-brown; scar of attachment a white point in a notch at the base of the seed. They often occur in large quantities in alsike and timothy seeds.



Eradication.—This weed does not long give serious trouble where a short rotation of crops is practised and where thorough cultivation False Flax, and seeding to grasses is done with spring grains instead of fall wheat.

The first crop of alsike in the fall wheat districts usually contains some false flax and should not be taken for seed unless the weeds are first hand-pulled and destroyed.

Ball Mustard (*Neslia paniculata* (L.) Desv.).—Introduced from Europe into the West about the same time as Tumbling Mustard, Hare's-ear Mustard and Cow Cockle. A tall annual or winter annual. Stems erect, very slender; strong plants throwing out a few long branches. Whole plant yellowish-green and covered with small, appressed, star-shaped hairs. Lower leaves lance-shaped, narrowed at the base; stem leaves arrow-shaped, clasping the stem at the base, blunt-pointed. Flowers small, $\frac{1}{8}$ of an inch across, orange-yellow. Ball Mustard is very prevalent in the Prairie Provinces. The seed is enclosed in small, round, one-seeded, shot-like pods, commonly called "seed," which are borne on slender foot-stalks, about $\frac{1}{2}$ -inch in diameter, roundish, greenish-brown, roughly net-



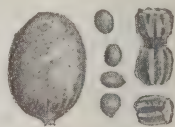
veined, somewhat like a small piece of dry earth. The contained seed is yellow, with the miniature root of the germ prominent. The whole pods are generally found in grain, as they do not open to discharge the seed.

Eradication.—Similar to Stinkweed and False Flax.

Wild Radish (*Raphanus Raphanistrum* L.).—Introduced from Europe. Abundant in the Maritime Provinces. Annual and winter annual, 1 to 2 feet



high, with a few long branches starting low down. The root is slender, not swollen as in the garden radish. The plant resembles Wild Mustard but the flowers are fewer and larger, noticeably paler yellow and conspicuously veined. The constricted seed pods are the most distinctive characteristic; with these no mistake can be made in identifying the two plants. In Wild Radish the seed pods have no valves, but are composed of two joints, the lower one small, $\frac{1}{10}$ of an inch, and seedless, which remains attached to the footstalk; the upper cylindrical, $1\frac{1}{2}$ inches long, with several one-seeded cells formed by transverse partitions. This seed-bearing portion separates from the first joint,

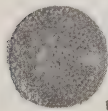


leaving it attached to the footstalk; in threshing, it is often broken up into single-seeded sections. The seed itself varies much in size and shape, being about $\frac{1}{8}$ of an inch long, oval, irregular, slightly flattened, reddish brown, the surface very finely netted. The seed pods are frequently found in grain, especially oats. Wild Radish is a coarse, vigorous weed, not less objectionable than Wild Mustard though less difficult to suppress. Grain crops polluted with it are troublesome to harvest as the bulky nature of the plants prevents the elevation of the grain in self-binders and greatly increases the amount of binder twine required.

Eradication.—Summer fallow. Hoed crops with thorough cultivation. Rotation of crops.

Wild Mustard (*Brassica arvensis* (L.) Ktze.), and other wild Brassica species.—Wild Mustard is the commonest and one of the most injurious weeds belonging to the Mustard family. It is general

throughout Canada in farm crops and waste places, being especially abundant along river valleys. It is an annual. Stems erect, branching, 1 to 3 feet high, rough, with stiff, somewhat downward directed hairs. The purple at the junction of the branches with the stem is a striking characteristic. Flowers bright yellow, fragrant, $\frac{3}{8}$ -inch across. Seed pods 1 to 2 inches long, knotty or slightly constricted between the seeds, ribbed and rising obliquely on short, thick footstalks, tipped with a long empty or one-seeded, two-edged beak, which breaks away whole from the ripe pod. Each pod contains about 15 to 17 seeds. When ripe the pods split and much of the seed is left



on the land at harvest time; thus the plant rapidly increases on land devoted to cereal grains, particularly oats. The seeds vary somewhat in size, but are generally about $\frac{1}{16}$ of an inch in diameter, quite round, dark brown or reddish black, almost smooth to the naked eye but slightly pitted under a glass and have a decidedly pungent taste. They are frequently found in great numbers in grain and occasionally they occur in small seeds. Among the other wild Brassicas, not so common, the seeds of which closely resemble those of Wild Mustard, are **Indian Mustard** (*Brassica juncea* (L.) Cosson), **Black Mustard** (*B. nigra* (L.) Koch) and **Bird Rape** (*B. campestris* L.).

Eradication.—Similar to Stinkweed. Avoid cereal crops where practicable.

Hare's-ear Mustard (*Conringia orientalis* (L.) Dumort). Introduced from Europe, probably with flax seed, about 1892. Annual and winter annual. Stems erect, with few branches, 1 to 4 feet high. Whole plant perfectly smooth, and, when young, covered with a fine bloom like that of cabbage. Leaves fleshy, without teeth, the root-leaves obovate, gradually narrowed to the base; those on the stiff stems, which become wire-like when ripe, oblong oval, shaped like a hare's or a rabbit's ear, clasping the stem by two rounded, ear-like lobes. Flowers creamy-white, $\frac{1}{4}$ inch across. Pods square, 3 to 4 inches long.



Hare's-ear Mustard is quite general throughout the Prairie Provinces, especially in southern Alberta, in grain fields, on stubble and by roadsides; spreading rapidly. The seed is dark-brown, rounded oblong, pointed at the scar end, $\frac{1}{12}$ of an inch long, granular

roughened; when soaked in water, covered with short, erect, white mucilaginous hairs. In shape it resembles the seed of common False Flax. The seeds are commonly found in western grain.

Eradication.—Similar to Stinkweed. A few years in meadow will greatly reduce this pest



Tumbling Mustard (*Sisymbrium altissimum* L).—Introduced into the Prairie Provinces from central and southern Europe about 1887. Annual and

sometimes winter annual; 2 to 4 feet high, stem branching, the lower part and the root leaves downy and glandular, with a musky odour; upper part of the stem and the much divided leaves smooth. The young plants form a rosette of soft, pale green, downy leaves, shaped much like those of the dandelion. On the flowering plants the leaves change very much in shape from the root up, no two being alike. Flowers pale yellow, $\frac{1}{8}$ inch in diameter. Seed pods 2 to 4 inches long, very slender and produced abundantly along the branches. Each pod contains about 120 seeds, and a single plant has borne as many as 1,500,000 seeds. When the seeds are ripe the whole head of the plant breaks off and is blown across the prairie, scattering the seeds far and wide.



The seeds, as in many "tumbling weeds," are not easily shed from the tough pods; consequently a head of this weed may blow about the prairie for a whole winter, dropping a few seeds at intervals for many miles. It occurs in grain fields and along roadsides. The seed is small, $\frac{1}{25}$ of an inch long, olive brown or greenish yellow, minutely roughened with mucilaginous glands, oblong, angular, cut off transversely at the scar end, sometimes almost square from compression in the pod, grooves conspicuously darkened. The miniature root of the germ is prominent and plainly visible through the thin skin.

Eradication.—Similar to that given for other mustards.

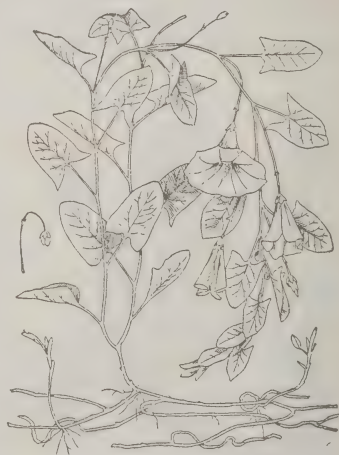
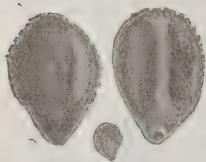
Wild Carrot (*Daucus Carota* L).—Introduced from Europe and now spreading rapidly in the clover seed producing districts of Ontario. It is an objectionable weed along roadsides, waste places and old meadows and occasionally gives trouble in cultivated fields. Biennial, with a large succulent root. Stems, flowers and leaves as in cultivated carrot. The fruit when ripe separates into two seed-like halves, commonly called seeds, each having 5 inconspicuous ribs running lengthwise and 4 winged secondary ribs bearing a row of barbed prickles which are easily rubbed off. The true seed is inside the fruit. The seed in the fruit is becoming quite a common impurity in Canadian grown red clover seed, but is more frequently found in imported stock. It seldom occurs in alsike.



Eradication.—Wild Carrot can best be kept in check in cultivated fields by a regular rotation of crops with thorough cultivation of hoed crops. Old meadows infested with it should be broken up and cultivated for a few years. Sheep will help to

suppress it in pasture lands.

Field Bindweed (*Convolvulus arvensis* L).—Introduced from Europe. Perennial, deep-rooting, with extensive, creeping, cord-like fleshy rootstocks; these throw up numerous slender branching and twining smooth stems, which form thick mats on the surface of the land and twist around any plants growing within reach, using them as supports and choking them out. Leaves about 1 to 1½ inches long on slender stalks, ovate or heart-shaped, arrow-shaped at the base. Flower-stalks slender, about the same length as the leaves; provided with miniature leaves at some distance below the large, open, funnel-shaped pink flowers, which are over an inch across. Fruit a round, cartilaginous, 2-celled capsule containing 3 to 4 seeds. The seed is rather large, ⅓ of an inch long, dark brown, pear-shaped; one face convex, the other bluntly angled with flat



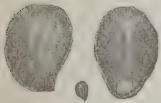
sides. Surface roughened with small tubercles; the basal scar is a roughly lined, reddish depression at the lower pointed end. Field Bindweed is exceedingly hard to eradicate because of the almost incredible persistence of the fleshy rootstocks. Although widespread throughout the Dominion and in restricted localities very troublesome, it is not yet a very common weed of Canada. The seeds are not often found in grain or clover seed. The plant propagates mostly by rootstocks and in many localities produces few seeds.

Eradication.—Persistent cultivation to prevent leaves forming. Smother small patches with straw or manure.

Clover Dodder (*Cuscuta* species).—Introduced from Europe. An annual parasite with slender yellowish and reddish stems, which twine about the host plant and become attached to the clover stems by suckers through which it obtains nourishment from the host. Flowers whitish or pinkish, in clusters along the thread-like, twining stems. There is probably no weed legislated against so much as Dodder. It is a serious pest in southern Europe, parts of the United States, Chili, and other temperate to warm climates having long summer seasons without frost. During years of shortage in clover-seed crop of Canada it has frequently been introduced and widely distributed in imported seed; but its ravages have been noted on red clover in only a few instances, and those in southern

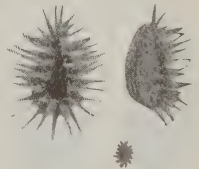


Ontario and the Pacific coast in years following an exceptionally late fall without frost until October. The seed is small, from $\frac{1}{30}$ to $\frac{1}{20}$ of an inch in diameter, yellow or brown, irregularly spherical, and more or less angled on the inner scar-bearing side; the surface granular roughened. Alfalfa Dodder has given trouble in southwestern Ontario and in the Prairie Provinces, where it is known to have continued in alfalfa for three years.



Eradication.—Badly infested fields should be ploughed under before seed forms. Small patches may be cut out and destroyed.

Blue Bur or Stickseed (*Lappula echinata* Gilibert).—Introduced from Europe. Annual and winter annual. Erect, branching, whole plant covered with short white hairs, which give it a grayish appearance. Leaves linear-oblong; root-leaves about 3 inches long, narrowed at base; stem-leaves stalkless. Flowers small, about $\frac{1}{8}$ -inch across, pale blue, erect, in leafy, more or less one-sided racemes, and with minute bracts. It occurs by roadsides, in waste places, and in some sections in cultivated fields in Eastern Canada and is a pernicious weed in fields of grain sown on stubble lands in the Prairie Provinces. The seed is about $\frac{1}{8}$ -inch long, dark brown, pear-shaped, with a rough surface, inner face sharply angled, outer face rounded, without spines in the centre, but having on the sides a double series of long stiff spines, each of which has at its apex a star of 3 or 4 sharp hooks. This nutlet is often found in clover and other commercial seeds, when many of the long barbed bristles may be rubbed off; but it may be recognized by the angled inner face, with the small basal



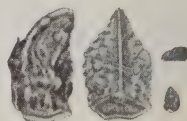
scar at the bottom of the central ridge and the unarmed area on the outer face. The seeds adhere to passing animals, bags, and clothing, and are spread in this way.

Eradication.—Fields badly infested with Blue Bur should be summer-fallowed. Thorough spring cultivation with the disc or broad-shared cultivator, or shallow ploughing, is necessary to prevent its abundant occurrence in crops sown on stubble land. Hand-pull from clover and grass crops.

Blueweed (*Echium vulgare* L.)—Introduced from Europe. Biennial, with a deep, black taproot. Whole plant bristly hairy, red at the base of the stiff



bristle on the stem. Flowering stems erect and wand-like, forming compound spikes of reddish buds and bright blue flowers, 1 to 2 feet high; the spikelets curved at the tips, as is usual in the Borage family. Root-leaves linear-oblong or linear-lance-shaped, narrowed at base, without teeth or divisions, bristly hairy above and below, 6 to 8 inches long, the first year forming dense rosettes of long leaves lying flat on the ground; leaves of the flowering stems stalkless. Common by roadsides and in waste places and fields throughout Ontario and the eastern provinces, chiefly on limestone and gravelly or poor soil. The seeds from each flower are $\frac{1}{8}$ -inch long, dark brown, hard and rough, irregularly angular and cone-shaped, sharply



angled on the inner face and rounded on the outer, with a keel running from the sharp apex half way down the outer convex face; basal scar a large, flat, triangular surface, acutely margined, marked with two little cone-like projections and a small deep depression close to the inner angle. They occur quite frequently in clover seed.

Eradication.—Keep closely cut and thus prevent seeding. Short rotation of crops with fall ploughing and thorough spring cultivation.

Ribgrass (*Plantago lanceolata* L.)—Introduced from Europe. Perennial or biennial. Rootstock short. Leaves numerous, 2 to 12 inches long, narrowly lance-shaped and distinctly 3 to 5-ribbed, hairy, with tufts of brownish hair at the base. In the first year the leaves lie close to the ground, forming a dense rosette; on old plants they are erect. Flower stalks stiff, slender and grooved, 1 to 2 feet, much taller than the leaves. Flower heads at first ovoid and rather showy by reason of their numerous yellow stamens, elongating with age and forming dense, cylindrical, black spikes of seed, from 1 to 4 inches long. It occurs throughout Canada; most abundant in clover crops. The seed is about $\frac{1}{10}$ inch long, chestnut brown, minutely granular-roughened but highly polished, boat-shaped with rounded ends, the outer face rounded with the edges

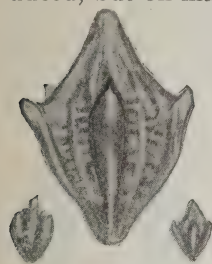


folded inward around a deep, longitudinal groove, in the centre of which lies the dark-coloured scar which sometimes has a pale ring of dried mucilage around it. Ribgrass seeds are one of the most common impurities in red clover seed and are found less frequently in alsike and alfalfa seed.



Eradication.—Use clean seed. Short rotation of crops.

Ragweeds (*Ambrosia* species). **Great Ragweed** (*Ambrosia trifida* L.), is a native annual which occurs occasionally in the eastern provinces and is abundant in the Red River Valley in Manitoba, extending westward mostly along the railways. It is a tall, coarse, branching plant, 4 to 8 feet high with rough stems and leaves. Leaves variable in shape; on young plants they are deeply indented but scarcely lobed, but as the stems grow, 3 or even 5 lobed leaves are produced, but on many plants leaves may be found



without lobes. The male and female flowers are borne in different heads on the same plant; the male in long slender spikes at the ends of the branches, and the female two to three together, stalkless, in the axils of the leaves at the base of the spikes. Male flowers $\frac{1}{4}$ -inch across,

cup-shaped, nodding; stamens yellow and conspicuous. Female flowers inconspicuous; pistils slender and purplish. The seed is about $\frac{1}{4}$ of an inch long, brown, urn-shaped, tipped with a tapering beak and bearing around the base of this, about one-third from the top, 6 or 8 blunt spines, like the points of a crown, which are the ends of more or less distinct ribs. Wheat from some districts in the Prairie Provinces often contains considerable quantities of Great Ragweed seed.



Eradication.—Summer-fallow, followed by spring cultivation. Mow edges fields and roadways.

Common Ragweed (*Ambrosia artemisiifolia* L.) is the most widely distributed member of this group, being especially abundant in southwestern Ontario.

It is a native annual, a coarse, branching plant with hairy stems 2 to 4 feet high. Leaves thin, smooth above, grayish white beneath from short, downy hairs, much cut up, pinnatifid, twice divided. The flowers closely resemble those of Great Ragweed but are smaller. The seed is from $\frac{1}{12}$ to $\frac{1}{6}$ of an inch long, dull light straw to dark brown, somewhat pear-shaped, the apex long and tapering to a sharp point. The surface is veined and slightly ridged lengthwise. This ridge usually terminates in sharp teeth, which form a circle around and point toward the apex. These teeth vary in number, size and regularity and are sometimes entirely absent. The outer covering of the seed is brittle and may be more or less



broken away, thus revealing a smooth, brown, inner cover. The breaking off of this second coat shows the inside seed, which is greenish white, nearly round and slightly pointed at the base. Ragweed is a common impurity in red clover.

Eradication.—Avoid impure seed. Plow or disc stubble land immediately after harvest or mow to prevent seeding. Short rotation of crops.

Perennial Ragweed (*Ambrosia psilostachya* DC.) resembles common Ragweed in the shape of the leaves and flowers, but has running rootstocks which throw up weak stems. It occurs on the prairies occasionally.

Ox-eye Daisy (*Chrysanthemum Leucanthemum* L. var. *pinnatifidum* Lecoq and Lamotte).—Introduced from Europe. Perennial, shallow-rooted. Stems



numerous, simple or little branched, 1 to 3 feet high. Basal leaves are more or less pinnatifid or coarsely and irregularly toothed; middle and upper stem-leaves narrowly oblong or somewhat lance-shaped, conspicuously pinnatifid at the base. Flower heads solitary on long, naked footstalks, very handsome, $1\frac{1}{2}$ to 2 inches across; rays 20 to 30, pure white, spreading, two to three-toothed at the apex; centre flowers yellow. A single plant produces from 5,000 to 8,000 seeds. Abundant in old pastures, in meadows and by roadsides from the Atlantic coast to the borders of Manitoba and occasionally along the railways to the Pacific coast. The seed is $\frac{1}{2}$ of an inch long, club-shaped or elongate-ovate,



usually curved, almost straight on one side and convex on the other, the knob-like scar at the top prominent; 10 well-defined white ridges run the whole length of the seed, meeting at both ends; between these ridges the surface of the seed is black, minutely dotted with white; no pappus. Often found in large quantities in Canadian grown timothy seed.

Eradication.—Shallow ploughing followed by cultivation. Short rotation of crops.

Canada Thistle (*Cirsium arvense* (L.) Scop.)—Introduced from Europe. Perennial with deep running rootstocks. Stems erect, 2 to 4 feet high. Leaves variable in shape, waved and crested, very prickly, in some plants much less so than in others. Flower heads numerous, in a large loose corymb at the top of the stems. Flowers variable in colour, ranging from pale purple through shades of pink to white. Some plants bear male flowers only, which form no seeds, other plants female flowers only, which produce many seeds; the flower heads of male plants are nearly globe-shaped, 1 inch across, those of the female plant only about half as large, oblong with short florets. Large patches may be found bearing



only male flowers, showing that all the plants originated from a single seed. It is abundant in eastern Canada, Manitoba and British Columbia and is spreading rapidly in Saskatchewan and Alberta. The seed is $\frac{1}{8}$ of an inch long, light-brown, elongated oblong, smooth, somewhat flattened and curved, more or less



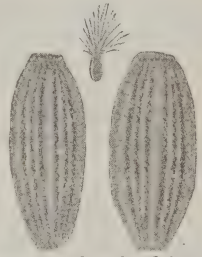
bluntly angled, marked with faint longitudinal lines; the top is nearly round, flat, and has a narrow rim with a small cone-shaped point in the centre. The seeds are frequently found in grass and clover seeds and sometimes in seed grain.

Eradication.—Frequent cultivation to prevent the formation of leaves. Plough in late June or early July and follow by almost weekly cultivation throughout the season. Root crops may be advantageously grown on infested land if kept clean. Small patches should be hoed or dug whenever the plants show above the ground.



Perennial or Field Sow Thistle (*Sonchus arvensis* L.) Abundant in cultivated fields and along roadsides, rapidly spreading from the Atlantic coast westward and already a serious pest in Manitoba. It is a deep-rooted perennial, with large and vigorous running root-stocks. Stems 1 to 5 feet high, hollow, simple, with few leaves, and branching at the top.

Whole plant filled with a bitter, milky juice. Leaves 6 to 12 inches long, pointed, deeply cut, the lower divisions directed backward, clasping the stem by their heart-shaped base, and edged with soft spines. Flowers bright yellow, $1\frac{1}{2}$ inch across, in corymbs, closing in strong sunlight. The seed is about $\frac{1}{8}$ of an inch long, dark, reddish brown, oblong, closely and deeply ridged lengthwise, the ribs wrinkled transversely, giving the



seed the appearance of being ridged both ways, bearing at the top a tuft of white, silky and persistent hairs which spread in drying and enable the seed to be carried long distances by the wind.

Eradication.—See Canada Thistle. Dig out or smother small patches as soon as discovered.

OTHER WEEDS

Many species of farm weeds give trouble in meadows, pastures, grain crops, hoed crops, lawns and roadsides that are not here classed as noxious. It is believed to be impracticable and undesirable to legislate against more than 20 or 25 of the most troublesome kinds commonly disseminated in commercial seeds. Noxious weeds that might very well be included in a provincial law having for its object the suppression of weeds growing on farm lands would naturally differ materially from those embodied in a law to restrict their distribution in commercial seeds. Many kinds of weeds become disseminated by wind, water and other natural agencies, the seeds of which seldom occur in grass or clover seed or in seed grain.

The ability of weed seeds to retain their vitality when embedded in the soil is one of the principal reasons why plants producing them are classed as noxious weeds. The length of time that mustard and other weed seeds will retain their vitality in the soil has not been very well understood. It is commonly stated that they will retain their vitality for an indefinite period and, when brought to the surface by ploughing, will germinate and produce a fresh crop of weeds. There is, however, a good deal of evidence from careful experiments to prove that such weed seeds will not retain their vitality longer than about 15 years.

Some weeds, while noxious from an agricultural standpoint, are not classed noxious under the Seed Control Act because their seeds seldom if ever occur in commercial samples. Others are objectionable weeds but their seeds are very fine and are easily separated from grain and other coarse seed. There are a great many weeds, other than those classed noxious under the Act, the seeds of which occur in commercial samples. Over one hundred and fifty different species of weed seeds were found in the samples analyzed for seed merchants and farmers during the past year. Many of these are seeds of useless or harmful plants that are of only secondary importance as weeds and occur very seldom. Others are common impurities but are not sufficiently dangerous to be classed noxious. The following are among the most prevalent or important species.

Large Crab Grass or Finger Grass (*Digitaria sanguinalis* (L.) Scop.)—Introduced from Europe. Annual. Found as a weed in clover and timothy fields. Culms erect or ascending from a creeping base, 1 to 3 feet long. Leaves thin, flat, 2 to 6 inches long, $\frac{1}{8}$ to $\frac{1}{4}$ inches wide, usually smooth, sometimes a little hairy. Spikes very narrow, 3 to 8, growing from one point at the end of the culm (name from digitus, a finger), greyish green, often tinged with rich purple. Spikelets $\frac{1}{16}$ to $\frac{1}{8}$ -inch long, in pairs. The seed is about $\frac{1}{8}$ -inch long, $\frac{1}{32}$ -inch wide, one side rounded, green, slightly shining, with a pointed hairy scale nearly half its length, the other side flat, purplish, distinctly 3-ridged, hairy at the edges with a very short smooth scale at the base. Seeds occur in timothy and clover samples; found more in timothy.



Small Crab Grass (*Digitaria humifusa* Pers.) is less troublesome than the preceding species for it does not root at the joints. The seeds are smaller and brown to black in colour.

Old Witch Grass (*Panicum capillare* L.), a stout annual with hairy leaves and a large loosely spreading panicle about half the length of the whole plant, is one of our most common grass weeds. It is sometimes very abundant in grain crops and meadows when the crop stand is not strong, but it is not a serious weed on well cultivated land. After ripening the plants break off and are blown about by the wind. They are often seen in large quantities along fences. The seed is about $\frac{1}{16}$ of an inch long, spindle-shaped in outline, highly shiny, olive green, with white parallel nerves, more yellowish when unripe. It occurs often in large quantities in the seeds of timothy and other grasses and less frequently in clover seed. A number of other species of the **Panic Grasses** are quite widely distributed but none are so common as Old Witch Grass. The Panic grasses are closely related to the Foxtails but differ essentially by the absence of the persistent bristles below the florets.



Green Foxtail (*Setaria viridis* (L.) Beauv.) An introduced annual found commonly in eastern Canada and becoming a serious pest in the Prairie Provinces, where it is taking heavy toll. As an annual this weed is very troublesome because of its extreme prevalence throughout Canada. Seed colour very variable according to the degree of ripeness; yellow, grey brown or purplish, the darker seeds mottled with darker spots. The kernel is greenish-white, convex on the outer face, which bears the germ, and flattened on the inner face. Green Foxtail seeds are the most prevalent impurity in clover seed. They are contained in about 90 per cent of the red clover samples analyzed at the Ottawa seed laboratory and about 50 per cent of the alsike samples. Green Foxtail seeds profusely from harvest to late autumn.



The presence of the seeds as an impurity materially reduces the value of red clover or alsike seed for commerce.

Yellow Foxtail (*Setaria glauca* (L.) Beauv.) is very similar to Green Foxtail. The branches, however, are more spreading, the whole plant is rather larger and more succulent, the spikes less compound and slenderer, with larger seeds. The bristles of the spikes are distinctly yellow. The young plant has a broad pale-green leaf and the base of the stem shows a characteristic yellow colour. The seeds are similar to those of Green Foxtail but larger. They are a common impurity in red clover and alfalfa seed, seed grain and feeding stuffs, but are seldom found in cleaned alsike and timothy. On account of their relatively large size they are easily cleaned from the smaller seeds. Thick seeding with clover and grasses will help to suppress the Foxtails in the autumn stubble and subsequent clover crop. In clover seed crops the patches that have been winter-killed should be mown while the Foxtail is quite green.



Eradication.—Disc stubble immediately after harvest. Hoed crops with clean cultivation late in summer.

Sweet Grass (*Hierochloë odorata* (L.) Wahlenb.) is a native perennial, rare in the eastern provinces, growing mostly in damp places by streams and rivers, but widely distributed in the Prairie Provinces where it seems to thrive on all kinds of soil. It is difficult to suppress because of its deep-rooting wide-spreading white rootstocks, which produce in summer many barren shoots with long, flat, deep green, shining leaves, over a foot in length. Flowering stems are thrown up early in spring, the first flowers opening when the stems are only a few inches out of the ground. When handled the plant produces a scent very similar to that of Sweet Clover. The naked seed closely resembles timothy, but is thinner, more cylindrical, and sometimes bears at its apex the remainder of the dried-off style (the elongated part of the pistil.) The miniature root of the germ is more prominent. The seeds are occasionally found in grass seed.



Eradication.—Plough in May. Choose a season when the soil is dry. Do not drag about the field with harrows as this starts new patches. After ploughing sow to some fast growing crop, such as oats or barley.

Ovoid Spike-rush (*Eleocharis ovata* (Roth) R. & S.) is a species of sedge widely distributed in wet places, the seeds of which are often found in timothy and occasionally in red clover samples. The seed is top-shaped, pale to rich chestnut brown, smooth and shining, about $\frac{1}{16}$ -inch long and $\frac{1}{32}$ -inch wide, with a lighter coloured triangular tubercle at the apex, $\frac{1}{4}$ its length, and 6 to 8 pale barbed bristles attached to the base of the seed and extending slightly beyond the tubercle. Usually found in timothy samples with one or more of the bristles broken off. Owing to their small size these seeds can readily be cleaned from most kinds of commercial seeds. Lands infested with this, or other species of sedges, should be thoroughly drained if possible and given clean autumn cultivation followed by hoed crop.



Fox Sedge (*Carex vulpinoidea* Michx.) is another species troublesome on low lands. This seed is sometimes found in timothy in great abundance, being more prevalent than two the former species.

Chess (*Bromus secalinus* L.), is a winter annual widely distributed wherever winter wheat or other fall or winter crops are grown. The stems are erect and simple. The portion of the leaf that embraces the stem is smooth, strongly nerved. Panicle loose, its branches somewhat drooping, with many flowered, hairless spikelets, which are so distinct as to show openings between them along the stalk, when viewed from the side. The seed is about $\frac{1}{8}$ -inch long, inclosed in scales of the same length. The outer scale is convex, thick and unrolled at the margin when ripe, provided with a short bristly awn. The inner scale is bordered with stiff hairs and adherent to the kernel. The footstalk of the grain above is strongly curved and club-shaped. The seeds are a common impurity

in winter wheat, and, to a less extent, in winter rye and other grains and seeds of commerce, and in feeding stuffs. Chess is objectionable in wheat for milling as it gives the flour a dark colour and a disagreeable flavour. Removing it by cleaning causes considerable loss of the smaller grains of wheat.

Eradication.—Avoid winter wheat. Short rotation of crops. Hoed crops.

Common Darnel (*Lolium temulentum* L.)—Introduced from Europe. Annual, smooth, stems 2 to 4 feet high, simple. Leaves smooth beneath, rough above, the portion embracing the stem is purple when the plant is young. Spike 6 to 10 inches long; somewhat resembling that of Couch Grass, but having the edges of the spikelets resting against the stalk instead of the broadsides, as in Couch Grass. The seed, somewhat swollen, resembles small barley, with blunt ends and a shallow wide groove on the inner surface. The inner scale is minutely bristly on the edges but not coarsely bristly along the margins, as in Chess; the outer scale is hard and flinty, as in the chaff of wheat, and either with or without a long awn. The kernel, after the husks have been removed, is greenish-brown, often tinged

with deep purple. The scales cover the seed very tightly, the inner one being adherent to it; in that condition it is nearly the same size and weight as small grains of wheat and is exceedingly difficult to separate from it by machinery. Darnel has become a pest in parts of the Red River valley, and is found occasionally throughout the Prairie Provinces. Its seeds are found chiefly in wheat.

Eradication.—Similar to Wild Oats. Seed affected areas to grass.

Skunk-tail Grass or Wild Barley (*Hordeum jubatum* L.) is a native perennial occurring from Lake Superior westward, particularly in alkaline soil where better grasses can not thrive and occasionally in Eastern Canada. This grass is a serious enemy to western stockmen, being a source of much injury to horses, cattle and sheep. The barbed seeds and awns penetrate the soft tissues of the mouth, causing irritation and inflamed ulcers, and work down beside the teeth, producing inflammation and swelling. It does not flower the first year, forming tufts 8 to 12 inches high. Leaves grayish-green. Flowers in beautiful, silky, bristly heads, 3 to 4 inches long, pale yellowish-green often tinged with red. The seed produced by the female flower is slender, sharp pointed, somewhat resembling a miniature seed of barley, and provided with a long, upwardly barbed awn. The heads adhere to passing animals and are carried long distances by the wind.

Eradication.—There is no difficulty in eradicating this grass from land that can be ploughed, but it gives considerable trouble in waste places where it ripens its seed which is widely scattered by wind and water.



Devil Grass (*Agrostis hyemalis* (Walt.) B.S.P.). A common weed in grain land in Western Canada where it gradually starves out the cultivated grasses. It is useless as hay on account of the minute barbs on its stems which produce sores and ulcers in the mouths of the animals eating it. The plant is a very fine silky perennial growing from six inches to a foot in height and having a pinkish colour. The seeds are about half the size of Red Top and somewhat similar in appearance. Late in the season the heads break off and on account of their lightness fly long distances with a strong wind, dropping their seed in all directions.

Eradication.—Plow deeply.

Sedges (*Cyperaceae*).—The sedges are similar to grasses in general appearance, with fibrous roots and mostly solid stems. Some species are troublesome weeds on wet lands. **Yellow Nut-grass** (*Cyperus esculentus* L.) is a troublesome weed in hoed crop or timothy grown on wet land. It spreads underground by small nut-like tubers and is difficult to eradicate. The stems are triangular, stout, 1 to 3 feet high, leafy at the base, with two or three leaves at the summit. Leaves light green, $\frac{1}{8}$ - to $\frac{1}{4}$ -inch wide, about the same height as the stem. These deep yellow or light chestnut coloured heads are easily seen in a field of timothy. The seeds, about $\frac{1}{32}$ -inch in length, 3-angled, light brown, are occasionally found in samples of timothy, but very seldom if ever in clover seed. Sedges are chiefly wet land plants and their presence is usually a sign that the land needs draining. Thorough under-drainage will tend to eradicate sedges by making conditions less suited to their growth as well as by making the crop more vigorous and choking them out.

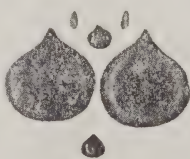
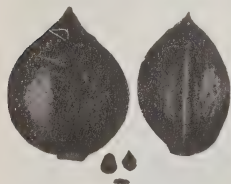
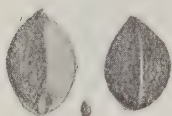


Sheep Sorrel (*Rumex Acetosella* L.) is naturalized from Europe and is now common in all parts of the country. It is a perennial and very persistent by extensively spreading, yellow, fleshy rootstocks. Stems slender, 6 to 18 inches, erect or nearly so, branched above. Leaves with silvery ear-like appendages, spreading outward from the base, narrowly arrow-head-shaped, toothless, 1 to 4 inches long, quite smooth and rather fleshy, on long stalks. Flowers numerous in panicle-like racemes, of two kinds on separate plants; the male flowers have conspicuous stamens; the female are much less showy and are tipped with three tiny, crimson, feather-like organs (the stigmas). The seeds, as they occur among clover and grass seeds, are generally covered by the three larger conspicuously veined calyx divisions which fit closely over the seed. The naked seed,

when the calyx divisions are removed, is $\frac{1}{20}$ of an inch long and nearly as broad, triangular-ovate, pale brown, shining. The seeds are one of the most abundant impurities in clover and grass seeds, being especially common in alsike.

Eradication.—Application of lime. Good cultivation with hoed crops. Pasture with sheep.

Lady's Thumb (*Polygonum Persicaria* L.) is an annual common all over the country, especially in low fields and meadows. Although Lady's Thumb and other of the Knotweeds and Smartweeds are widely distributed, they are not seriously noxious in most field and garden crops. The stems are erect, fleshy, nearly smooth, hairless. Leaves lance-shaped, pointed, nearly stalkless, the surface roughish, often dotted and marked with a dark triangular or round spot near the centre. The mode of flowering is an ovoid or short cylindrical spike, dense, erect, composed of pink or dark purple flowers. The seeds are



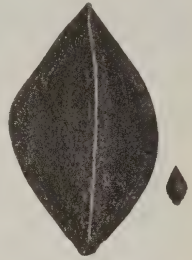
Lady's Thumb.

Pale Persicary.

about $\frac{1}{12}$ of an inch in diameter, ovate, heart-shaped, hollowed out on one side or roundly triangular, jet black, shining. They are a common impurity in red clover and are less frequently found in alsike, alfalfa and grass seed. **Pale** or **Dock-leaved Persicary** (*Polygonum lapathifolium* L.) very closely resembles Lady's Thumb. It is a common, tall-growing and rather aggressive weed among grain and clover on rich low land in all parts of eastern Canada. The seed is $\frac{1}{10}$ of an inch long, more roundly heart-shaped, chocolate brown, hollowed on both sides and never triangular.

Eradication.—Drainage. Late cultivation with hoed crops.

Wild Buckwheat (*Polygonum Convolvulus* L.) is general in cereal crops throughout Canada, but most prevalent in the Prairie Provinces. It is an annual introduced from Europe; a twining vine with rather rough branching stems and thin smooth, arrow-shaped leaves. Flowers greenish, drooping on short slender stalks, in small clusters, arising from the axils of the leaves, and in loosely flowered terminal racemes. Calyx 5-parted, persistent. The seed is dull, black, triangular, about $\frac{1}{8}$ -inch long, bluntly pointed at the apex and almost twice as long as broad, widest just above the middle; the germ is club-shaped, small, curved and lies along one angle of the seed in a groove. When found in commercial grain, the seeds are often without the black coat and appear naked, white, wax-like, with slightly rounded angles. They are the most



common impurity in cereals, being especially abundant in western grain, and constitute a very large percentage of the weed seeds occurring in elevator screenings. They are considered good feed, especially for poultry.

Eradication.—Summer fallow. Most of the early plants can be destroyed in grain crops by harrowing when the grain is about three inches high.

Lamb's Quarters (*Chenopodium album* L.) occurs throughout Canada in rich land. It is one of our most common garden weeds and commonly appears in cultivated fields. An annual, introduced from Europe and native. Extremely variable in every character. Mostly tall, succulent and herbaceous, with a slender, erect, grooved, much-branched stem, 2 to 6 feet high, with angular-ovate, pale green, coarsely toothed leaves, narrowed at the base and borne on slender footstalks. Flowers in compound spikes from the axils of the leaves. The seed is about $\frac{1}{20}$ of an inch in diameter, circular in outline, more or less flattened on one side, strongly convex on the other, edges bluntly rounded, the lower convex face grooved from the margin to the central scar, minutely wrinkled; colour shining black. The seeds, as found among crop seeds, have a thin envelope closely



adhering to them, as a brown or gray mealy deposit, which gives them a granular-roughened appearance; they also often have the dried, 5-angled calyx closed tightly over them. They are a common impurity in alfalfa and timothy, especially in the west. The seed is so nearly the same size as that of timothy that its separation is difficult, so that this weed should be hand-pulled from fields intended for seed. Next to wild buckwheat, these seeds are the most prevalent impurity in grain. Its hard flinty seed-coat makes it difficult to grind, so that it commonly occurs unground in feeding stuffs made from poorly cleaned grain.

Eradication.—As for Wild Buckwheat.

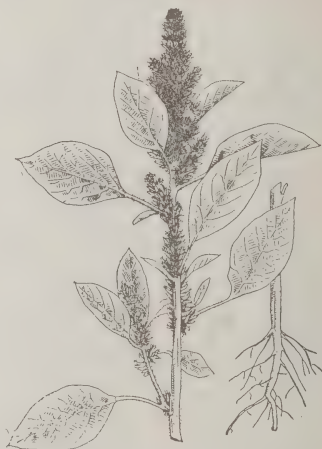
Russian Pigweed (*Axyris amarantoides* L.) was first noticed in Canada in 1886, by the roadside at Headingly, Man., 14 miles west of Winnipeg, where it is said to have been brought direct from Russia. It is now found along the railways throughout the West, and has been even detected on a railway bank as far east as St. John, N.B. It is an annual, tall, coarse plant, from 2 to 4 feet high, erect and widely branching, very leafy. When young much like Lamb's Quarters, but paler green with a more wand-like habit of growth, and instead of being mealy in appearance it has soft, short, star-shaped hairs. When full grown the whole plant forms a large pyramidal compound raceme; the stems, bracts and the papery calyx segments turn white and make it very conspicuous. The seed is oval, flattened, $\frac{1}{2}$ of an inch long, gray or brown with a silky lustre, surface minutely lined and wrinkled



lengthwise, basal scar a short thin groove across the lower end; many seeds have a close-fitting papery envelope, projecting above the top as a 2-lobed wing. The seeds are occasionally found in commercial samples.

Eradication.—Fields badly infested should be thoroughly summer-fallowed and the succeeding grain crop treated with the harrow when the plants are a few inches high.

Red-root Pigweed (*Amaranthus retroflexus* L.) is an annual introduced from tropical America and now established in all settled parts of the Dominion. It has a rosy pink tap-root. Stems erect, simple or branched, rough-hairy. Leaves on long stalks, ovate, bristle-pointed. Flowers inconspicuous, numerous, crowded into thick compound spikes at the ends of the branches and in the axils of the leaves. The seed is highly polished, reddish black to jet black, about the same size as that of Lamb's Quarters, circular or egg-shaped in outline, much flattened and equally convex on both sides. An immature or shrunken seed has a narrow, slightly flattened marginal band, which marks the location of the ring-like germ. Pigweed seeds are quite commonly found in clover and grass seeds especially alsike and timothy. Red-root is especially troublesome in garden and in potato and field root crops.



Eradication.—When embedded in the soil, the seeds retain their vitality for several years and produce seedling plants only when brought within about two inches of the surface by cultivation. Late cultivation of hoed crops should be made as shallow as practicable.

Tumble Weed (*Amaranthus graecizans* L.). A large bushy annual forming under favourable conditions a compact mass from one to two feet in diameter.

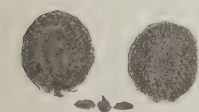


Leaves small oval, narrower at base. Flowers very small, borne in clusters in the axils of the leaves. When ripe the plants break off at their base and taking advantage of each wind, travel long distances, scattering their seeds as they go. Seeds black, very shiny, closely resemble Red-root but smaller and rounder in outline. They are often in western timothy and among the seeds of other fodder plants. This weed occurs chiefly on newly broken land in the Prairie Provinces where it is often abundant and a factor of no small importance in robbing the soil of moisture. It is, however, seldom injurious on old well-tilled soil.

Eradication.—Early discing or breaking. Summer-fallow followed by late spring harrowing of grain crop.

Spreading Amaranth (*Amaranthus blitoides* Wats.). Resembles common Tumble Weed but has rather large leaves and a prostrate manner of growth, forming mats upon the ground. The seeds which occur in alfalfa may be told from other Amaranths by their larger size.

Spurrey (*Spergula arvensis* L.) is an annual, now found quite commonly in grain fields in the eastern provinces and in parts of British Columbia. Stems branching from the base, 6 to 18 inches high, almost smooth, sparingly hairy above. Leaves narrowly linear, apparently in a circle around the joints of the stem but really in two opposite sets of 6 to 8 together, with scale-like, modified leaves between them. Flowers white, the fruit hanging abruptly downward. The seed is dull black, lens-shaped or round and compressed, with the margin extended into a narrow pale wing. The surface is more or less roughened with small, pale-coloured, elongated protuberances, like gland-tipped hairs. Both the protuberances and the wing are sometimes absent when the seeds occur among commercial seeds. They are a common impurity in grain grown in the Maritime Provinces

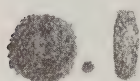


and Quebec and in timothy from Prince Edward Island.

Grass-leaved or Lesser Stitchwort (*Stellaria graminea* L.) perennial, the underground rootstocks sending up flowering stalks at intervals of a few inches; two inches to two feet high, slender weak, four-angled and roughened on the angles, with many grassy leaves in pairs; bearing many starry white flowers nearly $\frac{1}{2}$ -inch across. The seed is often found in clover and grass seed; it is the same size as that of Common Chickweed but more nearly circular. The surface markings are quite different; instead of bearing tubercles, thickly covered with short curved ridges in more or less regular rows.

Eradication.—Close and frequent cutting, as recommended for other perennials.

Common Chickweed (*Stellaria media* (L.) Cyrill) in spite of its frail appearance is a very hardy and persistent weed. It is an introduced annual occurring in all parts of Canada where the soil is moist and rich; stems diffusely branching, curving upward with a tendency to lie down. Roots hair-like and exceedingly tough. Leaves ovate. Stems bearing a conspicuous stripe of hairs down one side. Flowers $\frac{1}{4}$ -inch in diameter, numerous, solitary from the axils of the leaves, in old plants in terminal leafy cymes; corolla white. Fruit capsules cone-shaped, spreading or hanging down, longer than the calyx. The seed is small, $\frac{1}{24}$ of an inch in diameter, yellowish brown to dark brown, wedge-kidney-shaped, flattened and covered with coarse tubercles arranged in regular curved rows, about 5 on each side and 4 on the edge.



It is frequently found in clover and timothy seed and many samples, especially of timothy, are rejected on account of the prevalence of this impurity. It is so small that it may be removed without wasting any of the timothy. The 30 x 30 woven wire screen will accomplish this separation.

Mouse-Ear Chickweed (*Cerastium*) seeds are frequently found in clover and timothy samples. The seeds are small and may be removed by the sieves recommended for Common Chickweed seeds. The plants are somewhat similar to Common Chickweed. They have much the same habit of growth but are covered all over with downy hairs, whereas in Common Chickweed the hairs are confined to a line down one side of the stem.

Eradication.—Clean cultivation of hoed crops; disking of bare stubble lands directly after harvest, to check further seeding.

Tarry Cockle or Sleepy Catchfly (*Silene antirrhina* L.). A somewhat slender annual with small pinkish white flowers and greenish stem bearing at intervals on the upper branches long purplish sticky patches. The seeds are similar to Catchfly but about half the size and rather darker.

Eradication.—Disking of stubble land after harvest to prevent seeding. Short rotation of crops and clean cultivation of hoed crops.

Wood Whitlow Grass (*Draba nemorosa* L.) is a native annual and winter annual. Stem low, branching below. Leaves stalkless, oblong-ovate or lance-shaped, somewhat toothed, roughish. Flowers small, yellowish. Pods elliptical-oblong, half the length of the foot-stalks which are almost horizontal at maturity. The seeds are very small oval or egg-shaped and orange in colour. The flowers appear in May or late April and most of the injury is done during the former month. Troublesome only on summer-fallow or in gardens; easily destroyed by spring cultivation.



Purslane (*Portulaca oleracea* L.) is an annual introduced from Europe, now common in rich land, particularly in gardens; most abundant in the eastern provinces. It is a fleshy, prostrate, perfectly smooth plant, freely branching from a single central root, with fleshy reddish stems and dark green, alternate, obovate or wedge-shaped leaves mainly clustered at the ends of the branches. Flowers stalkless, solitary, about $\frac{1}{4}$ of an inch across, yellow, opening only on sunny mornings. Fruit capsule, membranous, many seeded, the top coming off as the lid of a box. The seed is black, roughened but shiny, about $\frac{1}{10}$ of an inch in diameter, narrowly kidney-shaped, much as in the Pink family, and like the seeds of most of the members of that family, with a curved germ running around the outside of the seed.



Eradication.—The seeds retain their vitality for several years. They do not germinate until the soil has become quite warm and they have been brought near the surface by cultivation. Several years of careful cultivation are required to eradicate Purslane. Seeds that have formed will develop and mature on the fleshy stems of the plant after it has been cut which makes it necessary to remove and destroy the plants after cutting. The seeds are seldom found in commercial samples.

Tall Buttercup (*Ranunculus acris* L.) occurs throughout Canada, especially in moist lands. It is a noxious weed with a poisonous, acrid, blistering juice; common in pastures and meadows. Perennial, with fibrous roots. Stems erect, generally hairy. The leaves in 3 divisions, each division stalkless, 3-cleft or parted, with deeply lobed segments. Flowers yellow. The dry seed-like fruits are in heads. The seed is about $\frac{1}{8}$ of an inch in diameter, flat, nearly round in outline but unsymmetrical with a somewhat wing-like margin; both the tip and the scar ends are pointed and very prominent, the former generally hooked. The colour varies from greenish-brown to nearly black; dull from the roughened surface. The seeds are occasionally found in commercial samples. Several allied species are prevalent in many districts as weeds of secondary importance. **Cursed Buttercup** or **Ditch Crowfoot** (*Ran-*



unculus sceleratus L.) is abundant along ditches, creeks and ponds and is occasionally found in wet pastures. **Small-flowered Buttercup** (*Ranunculus abortivus* L.) is common in old pastures and woods, less frequent in meadows and cultivated fields.

Eradication.—Drainage. Thorough cultivation with short rotation of crops. Avoid seeding to grass until suppressed.

Peppergrass (*Lepidium apetalum* Willd.) is a native annual and winter annual, widely distributed but most abundant in light sandy soil. Stems erect, profusely branching above, 6 inches to 2 feet high, somewhat hoary with short appressed hairs. Autumn plants produce a rosette of dark-green, deeply indented leaves, much like some specimens of Shepherd's Purse but more succulent. Stem-leaves with a few coarse teeth, narrowed at the base. The many nearly erect and spreading branches give this plant, when in seed, the appearance of a miniature tree, the numerous small, nearly round, flat pods taking the place of leaves; the real leaves fall away when the seeds begin to ripen. The flowers are minute. The seed



pods are about $\frac{1}{10}$ of an inch wide, heart-shaped, slightly longer than wide, notched at the top and at maturity separate into halves. The seed



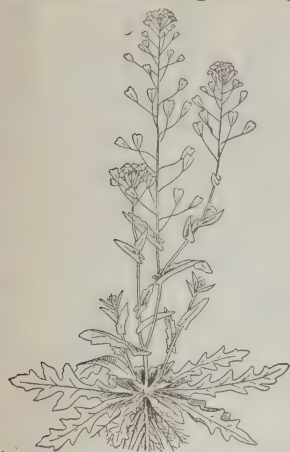
is about $\frac{1}{8}$ of an inch in length, bright reddish-yellow, egg-shaped in outline, much flattened, blunt on the straight side and very thin or slightly winged on the rounded side; both sides show a rather deep groove in the middle. When moistened the seeds develop a large amount of mucilage. Although there are only two seeds in a pod, each plant produces thousands of seeds. They are a common impurity in clover and grass seed, being especially abundant in timothy.

Eradication.—Thorough spring cultivation. Badly infested fields should be disced or ploughed directly after harvest, cultivated from time to time until winter and again until late June when they may be planted or sown to a late fodder crop.

Field Peppergrass or Cow Cress (*Lepidium campestre* (L.) R. Br.) is a biennial yet rare in Canada but occurring in the clover-growing districts of Ontario where it is increasing. The plant grows with two or three stems from the same root. The lower leaves are oblong and toothless; those of the stem are spear-shaped with blunt ends. The thick pods are broadly ovate, boat-shaped, being rounded below and hollowed out above. Each pod contains two seeds. The seed is $\frac{1}{12}$ of an inch long, egg-shaped, but pointed at the scar end. The surface is finely roughened and dull, with a mealy appearance. Two grooves, often filled with mucilage, extend from the sharp basal end almost to the other end of the seed. These seeds are now much more common than those of Peppergrass in red clover and alfalfa and are found to a less extent in alsike seed.



Shepherd's Purse (*Capsella Bursa-pastoris* L.) is an annual and winter annual occurring throughout Canada. The plants vary greatly. A seed-bearing plant may be a dwarf, little more than an inch or two high, or a vigorous, branching plant, three feet high, with many pods. There may be at the base a vigorous rosette of leaves, or none at all. The leaves may be deeply cut, pinnatifid, or without any teeth or division. The stem leaves are for the most part arrow-shaped, with two sharp, ear-like projections, one on each side of the stem. The flowers are small and white. The seed-pod is flat, triangular in shape $\frac{1}{4}$ of an inch long, wedge-shaped at the base, notched at the top, with the outer angles rounded. Each pod contains about 20 seeds. The seed is small, $\frac{1}{32}$ of an inch long, oblong, reddish-brown, the surface dull and punctured. When put in water it develops a large amount of mucilage and a covering of long but very fine transparent hairs. The seeds occur quite frequently in alsike and



grass seed and occasionally in red clover. Shepherd's Purse has an enormous power of propagation; a single plant will ripen 50,000 seeds. In meadows which have been thinned by winter killing the vigorous rosettes of autumn-started plants will crowd out grass and clover.

The seed is a common impurity of alsike and timothy seed but is so small that it may be easily removed by a fine woven wire sieve.

Eradication.—Summer-fallow. Spring cultivation. Hoed crops.

Rocket or Rocket Salad (*Eruca sativa* Lam.) has recently been introduced into Ontario, probably with European alfalfa seed, and is now frequently reported. It is a hairy annual, somewhat resembling Wild Mustard. The leaves are pinnatifid, with a large terminal lobe. The flowers are yellowish-white, characteristically netted with dark purple veins, aromatic. The pods are shorter than those of Wild Mustard, upright, the beak broad and flat. The seed is a little larger than that of Wild Mustard, flattened, olive-brown, the miniature root of the germ generally lighter in colour. It is pungent and bitter, with a flavour characteristic of radish. The seed is occasionally present in European alfalfa seed. The plant is seldom referred to as a noxious weed in Europe but it should not be allowed to mature its seeds in cultivated crops. Many of our worst weeds have been introduced through imported seed and have become widely distributed through lack of care in preventing the first plants



from seeding. Prevention is easier than cure in dealing with any weed and as Rocket belongs to one of our most dangerous plant families it should be carefully hand-pulled wherever it makes its appearance so that it can not get a chance to ripen seed and become established.

Green Tansy Mustard (*Sisymbrium incisum* Engelm., var. *filipes* Gray) is a native biennial occurring in grain crops in the Prairie Provinces and British Columbia and as a wayside weed in eastern Canada, where it is common along railways and where western grain or mill feeds have been distributed. In the first season it appears as a rosette of finely divided leaves lying on the ground. Stems 3 to 4 feet, erect, widely branching at the top and bearing an enormous number of narrow, smooth, slightly curved pods, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, on slender, spreading foot-stalks. Whole plant bright green and somewhat glandular. Leaves pinnatifid, each division



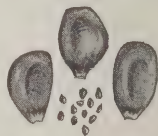
sub-divided into 2 or 3 linear-oblong segments, with or without teeth. Flowers yellow, $\frac{1}{8}$ of an inch across in an elongated raceme. The seed is small, $\frac{1}{25}$ of an inch

long, oblong, sometimes compressed at the scar end, reddish-brown, minutely roughened with mucilaginous hairs. The seeds occur in poorly cleaned western grain and occasionally in grass seed.



Gray Tansy Mustard (*Sisymbrium incisum* Engelm., var. *Hartwegianum* (Fourn) Watson) is similar to the above but grayer due to its being covered with short, gray, downy hairs. It has a more erect habit of growth, with pods much more crowded together. The seeds are similar to those of Green Tansy Mustard but ripen a month later.

These two coarse biennials grow only from seed but they throw out long branches from their white tap roots and draw nourishment from a wide area. As they stand considerably above the crop, they are a conspicuous advertisement of negligent farming.



Eradication.—The prevalence of these biennial mustards in grain fields of the Prairie Provinces is largely due to the practice of raising cereal grains on stubble land, with only surface cultivation in the fall or spring sufficient to produce a suitable tilth for a seed bed without first destroying the weed growth by ploughing, thorough discing or the use of the broad-shared cultivator. Summer fallows should receive clean cultivation until late in the fall. Waste places where it thrives should be sown to permanent grass and the weed growth kept cut until the grass has possession of the soil.

Hedge Mustard (*Sisymbrium officinale* (L.) Scop.) is a common weed along roadways and waste places. It seldom gives serious trouble in fields. The plant is from 2 to 3 feet high and of a ragged appearance. Flowers small, pale yellow. Pods slender, hard and brittle; when mature, closely pressed to the few-branched stem. Seeds sometimes found in timothy seed. They resemble somewhat the seeds of Tumbling Mustard but are larger.

Eradication.—This weed is easily destroyed along roads and waste places by cutting to prevent it from seeding.

Worm-seed Mustard (*Erysimum cheiranthoides* L.) is a native annual and winter annual, frequently found in waste places and on cultivated land throughout Canada. Stems erect, simple or branching, 6 inches to 2 feet high. Leaves dark green, lance-shaped, sparsely toothed. Flowers bright yellow, $\frac{1}{5}$ of an inch across, in terminal clusters about 1 inch across, on gradually elongating racemes. Seed-pods slightly curved, from $\frac{1}{2}$ to 1 inch long, obtusely 4-angled, erect on spreading footstalks. Each pod contains about 25 seeds. The seed varies somewhat in size and shape, generally pointed at one end, rounded at the other, about $\frac{1}{24}$ of an inch long, reddish yellow, with a dull surface. The miniature root of the germ is conspicuous. The seeds are very bitter, and on account of their very disagreeable taste some kinds of stock especially hogs, will refuse to eat chop



made from grain containing any appreciable quantity of it. It is a common impurity of grain, alsike and timothy.

Eradication.—The seeds are short-lived, and so this mustard is kept under control on land worked under a short crop rotation with clean cultivation. Fall cultivation of stubble land, followed by disking in spring before seeding, will keep this pest in check.

Small Wall-flower (*Erysimum parviflorum* Nutt.). Biennial or winter annual. A stoutish sparingly branched plant with yellow flowers and upright or spreading pods which are thicker but shorter than those of Worm-seed Mustard. Height from 10 to 20 inches. The seeds are about the same length as those of Worm-seed Mustard but average much wider and are squarer at the ends, practically never pointed. They are common impurities in western timothy. The plant sometimes causes injury to grain on poorly prepared fallow.

Western Wall-flower (*Erysimum asperum* DC.). Similar to the former but the flowers are much larger and the pods very long and widely spreading, often becoming horizontal when ripe. Seeds similar but less frequently met with.

Tower Mustard (*Arabis glabra* (L.) Bernh.). A tall plant, lower leaves stalked, rough; upper leaves smooth, stalkless, somewhat arrow-shaped; flowers small and white; pods long, clustered closely around the stem. The seeds which are met with in timothy are flat, brownish and somewhat winged. Several closely allied species occur in Canada.

Spider-flower or Stinking Clover (*Cleome serrulata* Pursh.) is a native annual, with erect stem, branched above and alternate leaves composed of 3 leaflets. Flowers pink or white, showy. The seed is round wedge-shaped with a deep curved groove running up each face two thirds of the way to the top from just above the sharp-pointed base. When ripe it is dark brown, roughened with pale, scurfy protuberances; the dry unripe seed is yellowish. Occasionally found in western grain.

Upright or Rough Cinquefoil (*Potentilla monspeliensis* L.) is a native annual common in old meadows and worn-out sandy soils throughout Canada. It is erect, branching, rough-hairy. The three leaflets of each leaf are obovate; those of the top leaves, which are stalkless, are toothed nearly the whole length. The mode of flowering is a leafy, rather close, cyme of yellow flowers. The seeds are grouped together on the receptacle, which is long, thin and downy. The seed when ripe is leather-brown, dull, about $\frac{1}{30}$ of an inch long, bluntly comma-shaped, with curved branching veins running longitudinally. Commonly found in timothy and alsike and occasionally in red clover seed.



The genus *Potentilla* is widely distributed, comprising many species closely related to the Upright Cinquefoil, as *Potentilla monspeliensis* L., var. *norvegica* (L.) Rydb., also commonly called

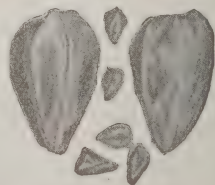


as **Upright or Rough Cinquefoil**. It is distinguished by less hairiness and by somewhat more narrowly oblong leaves. Both occur in similar situations and have about the same distributive range. The seeds of the cinquefoils are very similar and their identification is sometimes difficult. They vary only slightly in size and in the roughness of the net-like veins covering the surface, which sometimes are not apparent, especially when the seeds are not ripe. Another species of this genus which is sometimes found in moist land is **Silverweed** (*Potentilla Anserina* L.), occasionally mis-named Buttercup. It is a perennial with slender, jointed runners, which root and form new plants at each joint, like the strawberry. The leaves, silvery hairy beneath, are composed of from 3 to 10 large, oval, sharply-toothed leaflets on each side of the stalks, with very small ones between them. The long-stalked, golden-yellow flowers, nearly an inch across, are followed by a cluster of dry, smooth seeds. Silverweed roots on the surface of the ground and is best controlled by draining the land and ploughing down the plants.

White Cinquefoil (*Potentilla arguta* Pursh). Perennial, upright; very hairy; flowers much clustered, white; not unlike those of strawberry. Seeds very small; smooth, pinkish brown and pointed at one end. It may at once be separated from our other Cinquefoils by its white flowers and the seeds by their smallness. A rather common impurity in western timothy but is seldom troublesome unless the land has been sown down several years.

Eradication.—Ploughing at any time of the year. Proper drainage and short rotation of crops.

Prairie Roses (*Rosa pratincola* Greene or *Rosa arkansana* of Canadian writers, which includes *Rosa acicularis*, var. *Bourgeauiana* Crepin) are sometimes troublesome in parts of the Prairie Provinces. In southern Manitoba this dwarf, large-flowered rose is very persistent. Its deep perennial rootstocks send up many flowering shoots from the axils of the scales. The seeds vary greatly in size and shape, averaging about $\frac{1}{8}$ of an inch long, generally irregular-angular, with hard, yellowish shells. They are often found in the screenings of western grain and quite frequently in seed wheat. To destroy roses the land should be ploughed with a sharp plough in hot weather and then double disced at intervals of a week or ten days.



Sweet Clovers—Introduced from Mediterranean Europe, where for centuries they have been grown for forage and as honey plants. They should be considered as weeds when they grow where they are not wanted. Their good qualities are many but they differ in their qualities and habits from the commonly cultivated clovers and must be handled differently. Therefore their seeds are considered as impurities in the seeds of other crops.

White Sweet Clover (*Melilotus alba* Desr.) is much more prevalent than the yellow species. Stems from 3 to 10 feet tall, somewhat woody, many branched; leaves pinnately three-foliate, the leaflets very finely toothed; flowers in long, slender, one-sided racemes, white and very fragrant. The pod is thin, small, egg-shaped, covered with a network of ridges and having a short stiff point at the top. The seed is hard, small, $\frac{1}{8}$ of an inch in length, smooth, dull yellow, evenly egg-shaped with a V-shaped light mark running from the scar.



Yellow Sweet Clover (*Melilotus officinalis* (L.) Lam.) is a smaller plant, with stems 2 to 5 feet tall. The flowers are bright yellow, slightly larger but less fragrant than those of the white species. The plant often flowers a week earlier and holds its bloom somewhat later than white sweet clover, which makes it more valuable as a honey plant.



Black Medick (*Medicago lupulina* L.), introduced from Europe, annual, is a common weed in clover fields and lawns, thriving in moist soils. It grows from 6 to 18 inches in height, hardly erect, much branched, sometimes hairy, leaves bright green, small, of 3 leaflets. Flowers small, bright yellow in short close spikes, $\frac{1}{8}$ to $\frac{1}{4}$ of an inch long, becoming longer in fruit. Usually the bright flower heads and black cluster of fruit may be seen on the same plant as the seeds ripen quickly. The pod is thin, small, not more than $\frac{1}{2}$ -inch long, kidney-shaped with one end coiled, dark brown or black, rough-ridged, the main ridges following the outline of the pod. There are sometimes 30 pods in one cluster, but each pod contains only one seed. The seed is little more than $\frac{1}{16}$ of an inch long, hard, smooth and somewhat shining, egg-shaped rather than kidney-shaped, yellow to pale



olive-green. It has a sharp projection near the scar from which a light line runs towards the larger end of the seed. It is found frequently in commercial samples of red clover, alsike and alfalfa. In alfalfa and red clover it is usually found in the pod. It is sometimes used as an adulterant in clover. The seeds of Sweet Clover and Black Medick are sometimes confused with each other and with alfalfa seed. They are both thicker and shorter, being egg-shaped, while alfalfa seed is kidney-shaped or sometimes irregularly angled. Sweet Clover seed may be distinguished from Black Medick by its larger size and the V-shaped light mark running from the scar. With Black Medick there is a sharp projection near the scar from which a light single line runs towards the larger end of the seed.

Eradication.—Of value for sheep pasture. Hoed crops.

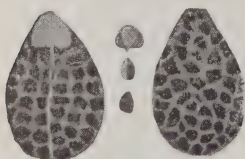
Wild Vetch or Wild Pea (*Vicia angustifolia* (L.) Reichard) is an introduced annual, widely distributed in cereal crops and as a wayside weed in eastern Canada. The plant is hairless or downy. Stem slender, simple or branched at the base. Leaves are composed of 2-5, rarely 6, pairs of linear or lance-shaped leaflets. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ inch long purple, 1 or 2 in the upper axils of the leaves. Pods black and linear with the tips sharp and turned upwards, 2 inches long, 4 to 12-seeded. The seed is round, ranging from $\frac{1}{10}$ to $\frac{1}{8}$ of an inch in diameter, velvety black or olive brown, mottled with white and dotted with fine, black spots; the whitish scar about $\frac{1}{5}$ the circumference of the seed in length, thin, threadlike. The seeds are a common impurity in grain grown in the Maritime Provinces, Quebec and parts of Ontario. They are especially objectionable in oats required for milling. A short rotation of crops designed to prevent Wild Tare from seeding will suppress it.



Wax-ball or Three-seeded Mercury (*Acalypha virginica* L.) is a native annual common in river flats and low fields in Ontario and eastward. It is a leafy plant, 1 to 2 feet high, with long-stalked, ovate leaves. It gives trouble in pastures, meadows and fields. On account of its acrid juice it is avoided by live stock and entails considerable waste wherever it occurs. The seed is about $\frac{1}{16}$ of an inch long, comparatively soft, with a thin coat finely striated, gray to yellow brown spotted with dark brown, sometimes reddish brown free from spots. It is ovoid, pointed at one end, rounded at the other. There is a dark slightly raised line running from the round end of the scar on the same side of the seed. The scar is one-third the length of the seed, oblong, raised and white. The seeds are quite frequently found in clover seed.



Sun Spurge (*Euphorbia Helioscopia* L.) introduced, is an erect annual, abundant in eastern Canada. Mode of flowering, nearly flat-topped, umbrella-like, surrounded at the base with a whorl of stalkless, obovate, finely and thickly dentate leaves. Pod or capsule smooth and even, 3-lobed. The seed at first sight somewhat resembles the pods of Ball Mustard in miniature. When examined closely, however, it is easily recognized. It is rounded-oval in outline, rolling freely on a smooth surface, a little flattened on one face, with a sharp central ridge running to the apex. The sides of the seed are not angled, the whole surface coarsely matted; scar kidney-shaped, white and very conspicuous. The seeds are seldom found in commercial samples. Sun Spurge is a common weed in gardens and waste places, being most troublesome on light, sandy soils.

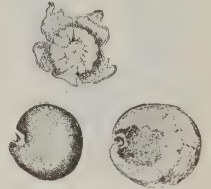


Eradication.—Special care is required to prevent the ripening of seed late in the summer. It will not long trouble lands worked under a short rotation with clean cultivation.

Round-leaved Mallow, Low Mallow or Cheeses (*Malva rotundifolia* L.) Naturalized from Europe. Biennial. Low and spreading from a deep



root branched from the base, stems 6 to 18 inches long. Leaves round-heart-shaped on long and slender stalks, margin scalloped and toothed. Flowers in threes or fours in the angles of the leaves, on slender flower-stalks, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long. Flowers about $\frac{1}{2}$ -inch wide, white, sometimes tinged with blue or pink. The fruit is made up of about 15 seed vessels arranged in a ring, $\frac{1}{4}$ of an inch in diameter and called the cheese (see illustration). The seed with its light-coloured outer coat on is a little more than $\frac{1}{16}$ of an inch and a little less with the coat off. The seed itself is hard, smooth, almost round, with a small piece out of one side of it; it is gray to dark brown in



colour with a white line around the scar. It is found in clover samples both with and without its outer coat. **Spiny Sida** (*Sida spinosa* L.), a profusely branched herb, about 1 foot high, covered with soft hairs, is another weed of secondary importance belonging to the Mallow family. The leaves are oblong or egg-shaped on long footstalks, dentate, with sharp teeth pointing forward. The flowers are greenish-yellow, small and shaped like those of the Hollyhock.

Eradication.—Good drainage. Hoed crops. Pasture with sheep.

Common St. John's-wort (*Hypericum perforatum* L.) introduced from Europe, is common in pastures, old meadows and roadways from Nova Scotia to Ontario. Perennial by runners at the woody base of the erect, much-branched, somewhat 2-edged stem. Leaves opposite without teeth or divisions, elliptic or linear oblong, black-dotted along the margin like the corolla divisions. Flowers deep yellow, grouped into terminal, loose cymes. The seeds are borne in three-celled, ovoid pods. They are about $\frac{1}{25}$ of an inch long, cylindrical, rounded at the ends, with a minute point. The surface is rough, pitted, a little shiny, dark brown to black in colour. The seeds occur very rarely in grass seeds. Some allied species are quite common in different parts of the country. **Great**



St. John's-wort (*Hypericum Ascyron* L.) is a common, coarse-growing weed in low rich soils and about swamps in Quebec and Ontario, occasionally occurring in old meadows and pastures along river flats. **Spotted or Corym-**



bed St. John's-wort (*Hypericum punctatum* Lam.) about 2 feet high, is abundant in the Bruce peninsula of Lake Huron and quite general throughout Ontario, Quebec, and eastward to Nova Scotia. **Pale St. John's-wort** (*Hypericum ellipticum* Hook), with its bright yellow flowers, is common in Quebec, northern Ontario, and westward to Lake Winnipeg.

Eradication.—Avoid grass crops. Repeated close cutting in waste places.

Common Evening Primrose (*Oenothera biennis* L.) is a tall, coarse biennial which occurs throughout the country and is easily recognized by its tall, branching habit (4 ft. by 3 ft.), its soft, downy, lance-shaped leaves, and its large showy, yellow flowers which open in the evening. This species makes only a rosette of leaves the first year. For this reason it appears only in crops sown in autumn or on stubble. In thin clover fields it sometimes occurs conspicuously and should be either spudded out or cut off below the crown in the first season; or the tall flowering plants should be cut off below the surface and pulled out before the seeds ripen. The seeds are produced in large numbers in long, tapering, 4-celled capsules, 2 rows of seed in each cell, which are clustered all along the stems. They are about $\frac{1}{8}$ of an inch long, dark reddish-brown, and with a roughened surface much angled by compression in the pods. They are a



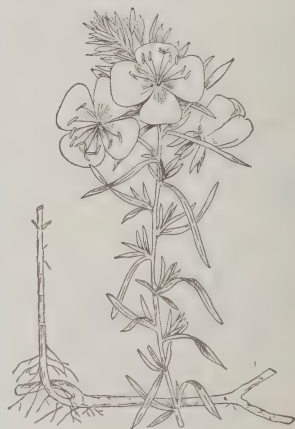
very common impurity in clover and grass seed, being especially abundant in timothy. As the pods do not easily shed their seeds and the plants are at all times conspicuous, much contamination of seed crops may be prevented by a little care at harvest time.

Eradication.—Prevent seeding.

White Evening Primrose (*Oenothera pallida* Lindl.) is a native perennial occurring in Manitoba and westward to British Columbia. It is deep-rooted and very persistent in sandy land. The roots are white and fleshy, wide-spreading and throwing up flowering stems at intervals, thus forming large patches. Stems mostly simple, shining white, sparsely downy above, erect or nearly so, about 3 feet high. Leaves from 1 to 4 inches long, narrow and waived, sometimes pinnatifid but usually without teeth or divisions in plants found in the West. Flowers axillary, large and



handsome, $1\frac{1}{2}$ inches across, waxy-white, turning pinkish as they fade, open in day time, odour unpleasant. Tips of the calyx divisions at the ends of the buds free, as 4 little points. Capsules narrow and curved, 4-angled, about 1 inch long with the seeds in single



rows in each of the four cells. The seed is about $\frac{1}{8}$ of an inch long, normally spindle-shaped but angular and somewhat twisted by compression in the pod, smooth and mucilaginous when soaked, yellowish-brown; under microscope minutely dotted with black and faintly striate lengthwise; not found in commercial samples.

Eradication.—Plow and summer-fallow after hay crops.

Spotted Cowbane or Water Hemlock (*Cicuta maculata* L.) is a native perennial occurring in low land along waterways. Stems stout, erect, hollow and jointed, widely branching, 3 to 6 feet high, quite smooth, pale green, dotted and streaked with purple. Root, a bundle of a few fleshy, spindle-shaped tubers, like small parsnips. Leaves compound, in 2 or 3 divisions, clasping, by an expanded base, the lower on long footstalks, the upper stalkless. The leaflets lance-shaped, deeply toothed. Flowers small, white, in compound, umbrella-like clusters 1 to 4 inches across; the little footstalks of the many flowered secondary clusters unequal, from 1 to 2 inches long. The seed is $\frac{1}{12}$ of an inch long, smooth, ovate, compressed on the sides, separating into boat-shaped, ribbed halves. When cut across, the seeds show four oil tubes between the ribs and two on the flat side. They do not occur in commercial samples. The



roots are intensely poisonous to stock, particularly cattle, which pull them out and eat them freely when grazing in spring. The roots look like small parsnips and, like them, have a strong aromatic odour, apparently attractive to stock. It is claimed that the flowering plants, when cut with hay, may be eaten by animals without any ill effects, but that the seed-bearing plants are dangerous. Hand pulling is the most effective remedy.

Small Gentian (*Gentiana Amarella* L. var. *acuta* (Michx) Herber). A native annual, one-half to two feet high. Lower leaves obovate, upper lanceolate or narrowly oblong, stalkless, clasping. Flowers numerous, tubular, blue; seed less than $\frac{1}{8}$ -inch in diameter, light brown, spherical with a small depression in one side. A common impurity in western timothy. This seed may be easily cleaned out of timothy by the use of a fine wire mesh sieve.

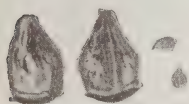
Hedge Bindweed or Convolvulus (*Convolvulus Sepium* L.). Perennial, spreading by thick underground rootstocks which break into lengths by cultivation and readily grow when covered. The trailing or twining stems are three to ten feet or more in length. Flowers large and showy, pink with white stripes, or clear white. Just below the flower and overlapping and concealing its five-lobed calyx is a pair of large, heart-shaped bracts, which are persistent and enfold the fruit. It can be distinguished from the Field Bindweed by these bracts. The seeds are not unlike those of Field Bindweed but average nearly twice as large. This is a very persistent weed in lowlands, particularly in parts of Manitoba.

False Phlox (*Gilia linearis* (Nutt) Gray). Annual or winter annual, six inches high with pointed leaves and small pinkish flowers clustered in a terminal head. The seeds which occur in western timothy slightly resemble those of Ribgrass but are darker and roughened, while instead of the opening on one side there is only an elongated narrow groove. They are larger than timothy and should not be difficult to clean out. The seed and that of Small Gentian are characteristic of timothy seed from western Canada. Neither persist in cultivated fields.

June Weed (*Ellisia Nyctelea* L.). A low spreading annual with pinnately divided leaves and small bell-shaped bluish white flowers. The seeds are very like Cow Cockle but when viewed through a lens show a fine net-like surface instead of the granulated one found in Cow Cockle. The plant takes less than two months to reach maturity and does all its injury in June; hence the name June Weed. In ripening it turns a characteristic black colour and is thus readily recognized even when dead.

Eradication.—Late spring ploughing and cultivation when the plants are small.

Pigeon Weed or Corn Gromwell (*Lithospermum arvense* L.) is abundant in western Ontario and troublesome in fields of fall wheat. It is a widely branching biennial or winter annual with white flowers and produces a large number of early-ripening seeds. The plants should be hand-pulled when practicable. The seed is similar in size and general shape to that of Blue Weed, but rather less angular and with a much smoother surface. Instead of having rough projections, it is deeply and irregularly grooved, with prominent ridges between the grooves. It may be easily recognized by the basal scar, which is oval or obtusely 3- to 5-angled; instead of the pit at the inner angle and the two cone-shaped projections on an excavated surface, it has a convex surface with two light-coloured distinct cones. These seeds are common in poorly-cleaned fall wheat and rye and are occasionally found in clover seed.

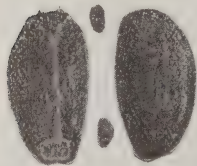


Eradication.—Land is best cleaned of Pigeon Weed by a short rotation, including grain sown in the spring instead of autumn, and well cultivated hoed crops. Plants which start growth in autumn can be destroyed by fall or spring ploughing or discing.

Blue Vervain (*Verbena hastata* L.). A tall perennial from 4 to 6 feet high; leaves stalked, lance-shaped, taper-pointed, with sharp, forward-pointed teeth. Flowers violet-blue, small, borne in cluster of spikes at the summit. The seed is brown except the large, whitish basal scar at the bottom of the inner face. The outer face is convex, irregularly ridged lengthwise and sharply angled at the sides. The inner face slopes to the margin from a sharply-angled central ridge. The seed is found in timothy and other grass seeds. Blue Vervain grows in rich soil in moist situations. It seldom gives trouble except in low grounds and may be eradicated by draining the land and cultivating it thoroughly.



American Dragonhead (*Dracocephalum parviflorum* Nutt.) is a native annual or biennial quite widely distributed in the Prairie Provinces. The seeds are much like those of Hedge Nettle, but longer ($\frac{1}{8}$ -inch) and narrower, being twice as long as wide, more angular and somewhat winged and wrinkled along the angles near the apex. The basal scar is large and curved, with a slit in the middle, giving it the appearance of a mouth; colour dark brown; the outer convex face distinctly ridged lengthwise and granular roughened. The seeds are frequently found in western grain, being very common in wheat screenings; they occur occasionally in grass and clover seed. American Dragonhead will not long give trouble on well cultivated land.



Hemp Nettle (*Galeopsis Tetrahit* L.), an introduced annual, is a common weed around barns and in rich damp soil in grain fields in all settled parts of Canada. It is very prevalent in the grain fields of Prince Edward Island. The stems are erect, tall, swollen below the joints, rough hairy. Leaves ovate, with strong, forward-pointing teeth, tapering at the end, on slender footstalks. Flowers purplish, white or variegated, grouped into nearly stalkless clusters at the axils of the leaves; corolla dilated at the throat, about twice as long as the calyx; the teeth of the latter needle-pointed, bristly. The seed closely resembles that of cultivated hemp, though smaller, about $\frac{1}{8}$ of an inch long. It is broadly egg-shaped in outline, one surface rounded, the other bluntly keeled from the round, flat, depressed scar up to the

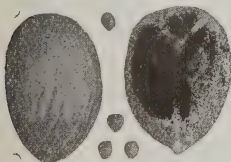
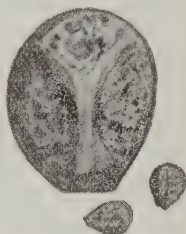
middle. The whole seed is grayish-brown, wrinkled from unevenly scattered, whitish tubercles. The seeds are quite common in grain grown in the Maritime Provinces and are occasionally found in alfalfa and red clover seed.

Eradication.—Drainage followed by thorough cultivation; keep closely cut or hand pull in waste places.

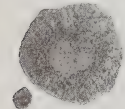
Hedge Nettle (*Stachys palustris* L.) is native, occurring in moist lands throughout Canada. A secondary weed in eastern Canada and northern Alberta, giving trouble only in moist, low lands in grain fields and meadows. It is perennial by a tuber-like rootstock producing many runners. Stem erect, leafy, its edges with coarse, downward turned hairs. Leaves stalkless, lance-shaped, oblong, tapering at the apex, rounded at the base with rounded teeth, hairy. Flowers pale red or spotted, formed into a long, interrupted spike of 6 to 10-flowered whorls at the axils of leaves; calyx half the length of the corolla, bristly hairy, with spiny teeth. The seed is a dark brown or black nutlet, about $\frac{1}{12}$ of an inch long, egg-shaped, pointed at the base, which bears a small, shrunken scar. The one side is sharply keeled from the scar up to two-thirds the length of the seed;

surface dull, finely wrinkled. The seeds are found abundantly among screenings of western wheat, quite frequently in seed grain and occasionally in clover and grass seed.

Eradication.—Good drainage, clean cultivation with short rotation of crops, will check this weed and enable cultivated crops to smother it out.



Toad Flax (*Linaria vulgaris* Hill.), introduced from Europe, is quite common in eastern Canada and spreading rapidly, especially in light and shallow soils. It is a persistent weed in waste places, roadsides, meadows and crops, being perennial and deep-rooted. The stems are erect, slender, becoming wiry. Whole plant hairless, slightly waxy. Leaves stalkless, extremely numerous, mostly alternate, linear, without teeth or divisions, acute at both ends. Flowers nearly an inch long, showy pale yellow with orange lips, borne in erect dense racemes; the two-lobed corolla closed and mouth-like, but by a gentle pressure at the sides, it opens and closes like the muzzle of an animal. The seed is about $\frac{1}{12}$ of an inch in diameter, including the wing, dark brown to black, flat, round or oval, disc-like, roughened with tubercles and surrounded with a circular wing, as broad as the seed itself, finely radiate.



The seeds seldom occur among crop seeds.

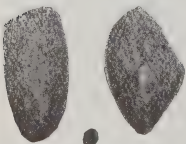
Eradication.—Short rotation of crops, with deep, thorough cultivation in spring and fall, will suppress Toad Flax. Badly infested meadows or pasture lands should be brought under cultivation by ploughing in July, summer-fallowing until autumn and planting with hoed crop the following spring.

Common Plantain (*Plantago major* L.) is a native perennial which occurs throughout the Dominion generally, in rich, moist soil, often in lawns and door-yards. Rootstock short and thick, bearing many thick-spreading roots and a large tuft of dark green, oval, long-stalked, coarsely-toothed, spreading or upward curving leaves, strongly nerved underneath, and several dense spikes, 3 to 12 inches long, of inconspicuous flowers with purple stamens. Seed capsules oval, dividing about the middle. The seed is about $\frac{1}{20}$ of an inch long, greenish-brown, variable in size and shape according to the number in the capsule (which varies from 8 to 16), rounded on the outer face, angular on the inner scar-bearing face; scar pale and conspicuous. The surface of the seed is finely netted with dark brown broken waved lines, which radiate from the scar. The seeds are a common impurity in timothy and clover

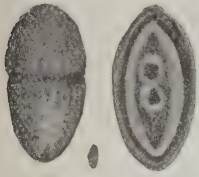


seed. Common Plantain occurs in various forms, some of which may be distinct species, as indicated by the difference in habit of growth and degree of hairiness. It is found throughout the Dominion, generally in rich moist soils.

Pale Plantain (*Plantago Rugellii* Dene.) often occurs with Common Plantain. It is a rather larger plant with more erect, smooth leaves, of a paler or yellowish green, the leaf-stalks purple at the base. The spikes are longer and the flowers less crowded, the capsules more pointed, 4 to 9-seeded, opening below the middle. The seed is of the same angular shape as that of the Common Plantain but about twice as large and nearly black, with the surface merely roughened, not lined and netted. It is very common in timothy and alsike seed, even more so than Common Plantain seed.

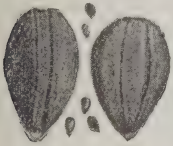


Bracted Plantain (*Plantago aristata* Michx.) is a western annual which is rather rare in Canada, although its seeds are occasionally found in grass and clover seeds. The whole plant is downy; leaves narrow, linear, grass-like; flower-stalks erect, bearing thick, cylindrical spikes 1 to 4 inches long with conspicuous, pointed bracts. Capsules two-seeded. The seed is boat-shaped, of the same size and form as that of Ribgrass but slightly wider, with sharper edges to the margin of the inner face. The elongated scar consists of two small, shallow pits lying close together in the centre of the inner excavated face, the whole of which is whitened by a coat of dried mucilage. The round outer face has a distinct shallow groove crossing it just below the middle. This groove and the two pits of the scar are the best characteristics for distinguishing this seed.



Eradication.—All the Plantains are difficult to eradicate from lawns when they become established. They may be weeded out when the soil is firm by forcing a small implement like a chisel, with a half-round blade having a point like a spoon, between the soil and the fleshy crown of the weed to a sufficient depth to break the plant away from its fibrous roots without disfiguring the turf.

Heal-all or Self-heal (*Prunella vulgaris* L.) is a native perennial which reproduces by running rootstocks. It is widely distributed over the continent in woods and fields but is not a very dangerous weed. The seed is about $\frac{1}{16}$ of an inch long, brown, slightly glazed, longitudinally striped, egg-shaped, sharp pointed at the base, which bears a white, heart-shaped scar with a deep depression in the centre. The seeds are quite a common impurity in red clover and grass seed and are occasionally found in alsike seed and alfalfa. Heal-all, like most other members of the Mint family, is not of great importance in agriculture as a weed and will not remain long or give serious trouble in land that is well cultivated under a short rotation including hoed crops.



Narrow-leaved Goldenrod (*Solidago graminifolia* (L.) Salisb.), is a native perennial with running rootstocks which occur in low land throughout the Dominion. The stems are erect, branching above into cymes, 2 to 3 feet high, almost smooth. Leaves numerous, linear-lance-shaped, 1 to 5 inches long, the edges rough-hairy. Separate heads of flowers about $\frac{1}{4}$ -inch across, bright golden-yellow, in dense, flat-topped clusters. The seed is small, white, about $\frac{1}{16}$ of an inch long, ovate-oblong, nearly cylindrical, slightly tapering, many-ribbed, downy. The pappus is white, consisting of a single row of rough bristles, about twice the length of the seed. Goldenrod seeds are seldom found in commercial samples, but are blown long distances by the wind. The plant spreads locally by running rootstocks and if left undisturbed soon forms large patches. Several other goldenrods are rather troublesome free-growing perennials; among them are



Tall Hairy Goldenrod (*Solidago rugosa* Mill.) with long hairs, crowded leaves and a broad pyramidal panicle; **Tall or Canada Goldenrod** (*Solidago canadensis* L.) and varieties, with a slender stem, hairless at the base, and thin, narrow-lance-shaped leaves; and **Smooth Goldenrod** (*Solidago serotina* Ait.) with stout, smooth stems, leaves smooth on both sides. These showy autumn-flowering plants are wayside and grass-land weeds and do not give trouble on fields under regular cultivation.



Fleabanes (*Erigeron* species). A number of Fleabanes are widely spread, occurring as weeds in meadows and waste places. They are annuals and not particularly dangerous. Any method of cultivation which prevents them from going to seed will eradicate them. Their seeds are occasionally found in grass and clover seed, but as a rule they ripen and are blown away before the seed crop is harvested. The seeds of the different species are very much alike and closely resemble the seeds of the Goldenrods. **Daisy Fleabane** (*Erigeron annuus* (L.) Pers.), illustrated, occurs very frequently in meadows. It has a tall, stout, much-branched stem. Leaves coarsely toothed, the lower ones ovate. Heads in corymbs with flowers white, tinged with purple. **Rough Daisy Fleabane** (*Erigeron ramosus* (Walt.) B.S.P.) is also found in clover fields in all parts of eastern Canada. The stems are smaller and not so branched as with the preceding species, while the heads are smaller and the rays longer. Leaves without teeth or divisions. **Common Fleabane, Horse-weed or Fireweed** (*Erigeron canadensis* L.) is general in fields and waste places. It is most abundant in moist grounds and pastures, but is found in meadow land and even cultivated fields. It is sometimes tall and much branched, with wand-like stems; generally bristly hairy. Leaves without teeth or divisions, linear, the basal ones dentate. The numerous small white flower heads form a panicle. Fleabanes will not become troublesome under a short rotation of crops with clover and a hoed crop or bare fallow. Waste places should be watched and the weeds cut before they develop seed.



Poverty Weed (*Iva axillaris* Pursh.) is a native perennial occurring in grain fields and pastures from Manitoba to the interior of British Columbia, thriving in all soils but generally found on land where there is some alkali. The whole plant has a rank odour. Stems herbaceous, branching, nearly erect, from tough, woody extensive rootstocks 6 to 12 inches high, very leafy. Leaves thick, rough-hairy; the lower ones opposite, the upper alternate. Flower heads drooping, solitary, on short footstalks from the axils of the upper leaves, $\frac{1}{8}$ of an inch across, inconspicuous. The seed is $\frac{1}{8}$ of an inch long; colour variable, olive green, yellowish brown to almost black surface mealy and dull; pear-shaped, slightly flattened. There are seldom more than one or two seeds in each flower head and many heads have none.



Eradication.—Poverty Weed propagates mainly by its underground stems, which send up many flowering leafy shoots, and is difficult to eradicate when it becomes well established in the rich soils of western Canada. Ploughing for summer-fallow should be clean and deep, followed by frequent cultivation with a broad-shared cultivator.

False Ragweed (*Iva xanthifolia* Nutt). A coarse annual growing from 1 to 6 feet in height. It resembles a Giant Ragweed but has the leaves less divided while the seeds are small and pear-shaped, slightly flattened and black, clustered together in small heads. The weed is most frequently met with around barn-yards.

Cockleburs or Clotburs (*Xanthium* species) are tall, much-branched annuals, differing mostly in the character of their fruits or seeds. The leaves are heart-shaped or ovate, except in the **Spring Clotbur** (*Xanthium spinosum* L.) which has lance-shaped or ovate-lance-shaped leaves, tapering at both ends. Some species are abundant as weeds in river bottoms and moist soils throughout the Prairie Provinces and are particularly troublesome to stockmen in parts of Alberta. Other species are plentiful in the eastern provinces, and are frequently reported as a nuisance in sheep pastures. The burs are from 1 to $1\frac{1}{2}$ inches long, hard and leathery, armed with beaks (except in Spring Clotbur) and covered with more or less long, thick, hairy, recurved and crowded prickles. Each bur contains two oblong, flat seeds which retain their vitality for several years. Owing to their large size, the fruits do not occur in crop seeds, but they are distributed to quite a large extent by animals.



Eradication.—These coarse, annual weeds should be watched and, where practicable, hand-pulled from year to year to prevent seeding. Follow immediately behind binder while cutting grain, with disc to destroy plants and prevent seeding.

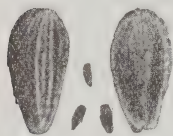
Cone Flower or Black-eyed Susan (*Rudbeckia hirta* L.) is a native biennial occurring in prairie and pasture lands, old meadows and occasionally in cultivated fields. Abundant in Quebec, where it has doubtless been introduced from western Canada. The plant is coarse, rough-hairy throughout. Stem simple, sometimes branched below. Leaves thick, without teeth or divisions, the upper ones oblong-lance-shaped, stalkless, the lower ones broader at the top, tapering towards the base, on footstalks. The mode of flowering is by showy, terminal, usually solitary heads, glaring golden orange, about the size of those of Ox-eye Daisy. Rays 10 to 20, much longer than the hairy scaly bracts around the flower head. The dark brown centre, with its chaffy scales hairy at the top, is high, cone-shaped, and often becomes column-shaped in fruit.



The seed is about $\frac{1}{16}$ of an inch long, black, 4-angled, narrow, with parallel sides; each side with fine, parallel longitudinal lines. The top of the seed is flat and bears no pappus. The seeds seldom occur in commercial samples. Cone Flower is objectionable in pastures to all kinds of live stock except sheep, which eat it and will do considerable to keep it in check when their pasture is short. When prevalent in meadows it materially reduces the yield and lowers the quality of the hay. Continued cutting for a few years, to prevent the plant from seeding, will suppress it.

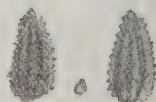


Black-headed Sunflower (*Helianthus scaberrimus* Ell.) and **Many-flowered Prairie Sunflower** (*Helianthus Maximiliani* Schrad.) are common though not very serious weeds in the Prairie Provinces. Their bright yellow flowers are conspicuous in grain fields. The stems are stout, simple or sparingly branched, rough or hairy; leaves thick, ridged and rough. In the former species the heads are nearly solitary and the disc inside the bright rays is dark. With the latter the disc is yellow. The seeds are about one-sixth of an inch long, brown, variable in shape but mostly narrowly oblong, egg-shaped in outline, flattened and rather angular, grooved lengthwise, cross-mottled with irregular, zigzag, white lines; both scars, at the top and the base, are conspicuous, the latter rather oblique. They are often abundant in screenings of western grain and frequently occur in seed grain, especially wheat.



Eradication.—Wild Sunflowers are best dealt with by a summer-fallow ploughed early and thoroughly worked throughout the season. **Wild Artichoke** (*Helianthus doronicoides* Lam.), closely allied to the two preceding species, is not so abundant but more difficult to eradicate.

Stinking Mayweed (*Anthemis Cotula* L.) is an annual or winter annual, introduced from Europe. A common weed in old settlements, around buildings, along roads and in waste places, from the Atlantic coast to Manitoba, where it is rare as yet and found only along railways, but is rapidly appearing in new districts. It is an objectionable pest in fields and gardens; most abundant where crops have killed out in wet places. The plant is dull green, slightly hairy or hairless, with an acrid taste and a strong, fetid odour. Stems 12 to 18 inches high, much branched from the root up. Leaves finely dissected, twice or thrice pinnatifid. Flower heads numerous, white, yellow-eyed, daisy-like, only about one inch in diameter. The seed is small, about $\frac{1}{16}$ of an inch long, ovate-oblong, or oblong, cut off straight at the upper end, with a small knob in the centre, the smaller end abruptly pointed. The surface roughened with tubercles arranged more or less symmetrically in about



10 longitudinal rows; sometimes, however, the surface is nearly smooth. The seeds are a common impurity in grass and clover seeds. The dust from Mayweed, Ragweed and some other species of this family, produced in threshing, is irritating if not poisonous and the pollen often produces hay fever when the plants are in flower.

Eradication.—Good drainage. Repeated close cutting in waste places.

Yarrow (*Achillea millefolium* L.). Perennial with finely dissected fern like leaves and flat-topped clusters of white or pinkish flowers.

The seeds are flat, chaff-like; about $\frac{1}{16}$ of an inch long; whitish with a darker centre. They are not uncommon impurities in timothy, particularly in western Canada.

Eradication.—Hoed crops. Pasture with sheep.

Common Ragwort (*Senecio Jacobaea* L.), introduced from Europe, is perennial from a few shallow, short, thick rootstocks. It is abundant in Pictou and Antigonish counties in Nova Scotia and in parts of Prince Edward Island; also reported from Quebec and some parts of Ontario. Ragwort is the cause of a curious and fatal disease of the liver in cattle. Stem stiff, erect, grooved, 2 to 3 feet high, much branched above. Root-leaves 6 to 8 inches long, stalked; stem-leaves stalkless, embracing the stem; all leaves dark green, deeply twice pinnatifid. Flower heads golden-yellow and very showy; $\frac{3}{4}$ of an inch across; numerous, erect, arranged in flat topped, dense, compound corymbs. The seeds are about $\frac{1}{12}$ of an inch long, creamy white, oblong, excavated at the top, with a small central point, deeply grooved along the sides; those of the centre almost straight, more or

less angled, with short bristles; those of the ray-flowers smooth, much curved and broader; pappus white. They are seldom found in commercial samples.

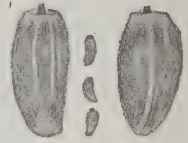
Eradication.—Rotation of crops. Close cutting pastures.

Lesser or Common Burdock (*Arctium minus* Bernh.), introduced from Europe, is a biennial from a deep, thick tap-root. It occurs in rich land in the older settled provinces; common by roadsides, in waste places and orchards in sod. Root-leaves large, heart-shaped, downy beneath, somewhat resembling those of rhubarb, footstalks hollow. Flowering stems much branched, from 3 to 6 feet high. Flowers purple. The seed is about $\frac{1}{4}$ of an inch long, pale brown with dark, transverse, zigzag, depressed marks, oblong-ovoid, cut off abruptly at each end, flattened, with about 5 longitudinal ridges generally somewhat curved; apical scar circular with a central point; pappus when present, consisting of several rows of short bristles, upwardly barbed. The seeds are not spread through commercial seeds to any extent.

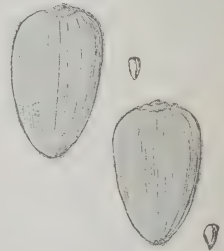
Eradication.—Pull young plants. Cut with spade below crown. Cut and burn mature plants.



Bull or Spear Thistle (*Cirsium lanceolatum* (L.) Hill.) is a large, coarse biennial, introduced from Europe, 2 to 4 feet high, widely branching, with many large, deep purple flower heads, $1\frac{1}{4}$ inches high by as much across. The seed is similar to that of Canada Thistle, but larger, about one-sixth of an inch long, plumper in proportion to the length, generally darker at the broader end, grayish brown in colour, marked with faint longitudinal lines. It occurs sometimes in seed grain, but very seldom if ever in clover or grass seed. Bull Thistle does not give trouble in well cultivated fields. It can be eradicated from waste places by cutting below the crown either the first year or before the seeds are ripe the second year. The application of a handful of salt to the root after cutting is effective.



Russian Knapweed (*Acroptilon Picris*, DC.) is a species of Star Thistle the seeds of which occur frequently in samples of European alfalfa. They are very easily seen among the alfalfa seeds as they are larger and bright white, rarely tinged with yellow at the ends. The seeds are hard, smooth and somewhat shining, with fine vertical lines or ridges which may be distinguished with an ordinary magnifying glass. The notch at the end of the seed, which is so characteristic of most of the Star Thistles, is wanting in this species. The seed is about $\frac{1}{8}$ of an inch long and half as wide, very nearly the same size and shape as that of Bull Thistle but curved evenly on both sides, while the Bull Thistle seed is a little longer and straighter in outline on one side with a deeper curve on the other. This Star Thistle seed is very white in appearance, whereas the Bull Thistle seed is gray or yellowish brown with darker lines and a yellow band around the top, forming a little well from the centre of which projects a short rounded knob. The *Acroptilon Picris* is the only pure white weed seed found in commercial samples. This annual weed readily succumbs to ordinary cultivation with rotation of crops.



Chicory (*Cichorium Intybus* L.)—Introduced from Europe. Perennial from a deep, long, thick root.



Stems 2 to 3 feet high, branched, hairy below. Root-leaves closely resembling those of Common Dandelion, 6 to 8 inches long, spreading on the ground. Flower heads bright blue, sometimes purple or nearly white, about two inches across composed entirely of strap-shaped flowers, usually closing by noon, in stalkless clusters of three or four together along the almost leafless stems. It occurs in eastern Canada, most abundant in Quebec. A common roadside weed and occasionally found in cultivated fields. The seed is $\frac{1}{8}$ inch long, dark brown or straw-coloured, mottled with brown, wedge-shaped, obtusely 3 to 5-angled, sometimes much curved; the surface grooved and ridged from top to bottom and



roughened crosswise with minute, close raised and waved lines; at the top, surrounding the apical scar, is a fringe of short, flat, white bristles. The seeds are often found among crop seeds, particularly in clover and grasses.

Eradication.—Chicory is not often seen in good farming districts except as a wayside weed. A short rotation of crops will soon suppress it.

Fall Dandelion or August Flower (*Leontodon autumnalis* L.) is a perennial introduced from Europe.



Abundant in the Maritime Provinces and parts of Quebec and recently reported from several places in Ontario as occurring in hayfields. It spreads rapidly from seeds, which are spread widely by the wind, and overruns meadows, pastures and lawns, where it chokes out the grass. Rootstock short and thick, frequently divided into several heads, each of which bears a thick tuft of toothed leaves, somewhat resembling those of Common Dandelion, and several few-flowered, branched, leafless, scaly stems. Flower heads over 1 inch across, bright yellow. The seed is $\frac{1}{4}$ -in. long, brown, linear, not beaked, ribbed lengthwise, marked with fine



lines crosswise; pappus dirty white, in one row of feathery bristles, about the length of the seed itself. The seeds are mostly scattered by the wind before the crops are harvested and seldom occur in commercial seeds.

Eradication.—Fields infested with this weed should be brought under cultivation with a short rotation, such as cereal grain, clover and grass for two years and hoed crops or peas for the fourth year, followed again by cereals.

Common Dandelion (*Taraxacum officinale* Weber) is a well-known pest of all long-settled districts. It is very common in lawns and almost impossible to eradicate when thoroughly established. It differs from Fall Dandelion in having long, deep, tapering roots, every part of which, if broken off, will throw out leaves and form new plants, as well as in having hollow, single-headed flower stalks. The seed is about $\frac{1}{8}$ of an inch long, spindle-shaped, ridged lengthwise, the ridges roughened with upwardly directed, rigid spines decreasing in size from the top to the base of the seed, where they appear as minute tubercles. The top end of the seed runs into a beak, about one-third of an inch



long, crowned with a white, thin pappus, half the length of the beak. This beak breaks off easily and is not present on seeds found in commercial samples.

Red-seeded Dandelion (*Taraxacum erythrospermum* Andr.) occurs with the preceding and differs from it merely by having more deeply divided leaves, sulphur-yellow, smaller heads of flowers, and reddish-purple seeds.



Eradication.—It is important to prevent dandelions from seeding in lands adjacent to lawns. Though entailing much labour the most satisfactory way to deal with them, when deeply rooted in lawns, is to loosen the soil with a digging fork and pull them up. Thorough and repeated spraying with sulphate of iron is recommended for lawns where this pest is prevalent.

Annual or Common Sow Thistle (*Sonchus oleraceus* L.) has about the same distribution as the Perennial Sow Thistle. Stem, 1 to 4 feet high. Leaves deeply cut and toothed with soft spiny teeth; the basal ones pinnatifid, terminated by a large lobe, clasping the stem by their heart-shaped base, ending in sharp points. The flower is pale yellow, about $\frac{1}{2}$ to 1 inch in diameter. The seed is somewhat similar to that of Perennial Sow Thistle but a little shorter, flattened, pointed at



Annual.

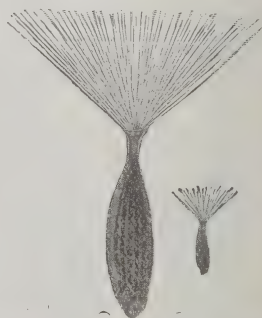


Spiny-leaved.



the basal end. The longitudinal ridges are wider apart, much finer, and the whole surface of the seed, the ridges as well as the interspaces, is finely wrinkled transversely. Pappus falls off easily. **Spiny-leaved or Prickly Sow Thistle** (*Sonchus asper* (L.) Hill.) is an annual of the same habit as Common Sow Thistle. It may be easily identified by its more prickly nature and less deeply cut leaves, the base appendages of which, instead of spreading, are appressed to the stem and rounded. The seed is similar to that of the preceding species in size and shape; distinctly 3-nerved on each side but with nerves and interspaces quite smooth. Both of these annuals are comparatively harmless weeds and easily controlled.

Blue Lettuce (*Lactuca pulchella* (Pursh.) DC.), is a native deep-rooted perennial, occurring throughout the Prairie Provinces and British Columbia in moist or sandy soil. It is a troublesome weed, having all the bad characteristics of Prickly Lettuce and much more difficult to suppress. Stems 2 to 3 feet, leafy below. Whole plant smooth and covered with a fine bloom, filled with milky juice. Leaves variable, linear-shaped or oblong; without teeth or divisions, or sometimes dentate or pinnatifid, the divisions directed backward; stem leaves less divided and stalkless. The flower heads are nearly one inch across, pale blue, not very numerous, on scaly footstalks, in a narrow panicle. The seed is about $\frac{1}{4}$ inch long, including the short, thick beak, the tip of which is whitish expanded into a short, cup-shaped disc, red when immature,



slaty-gray to purplish when ripe; club-shaped, flattened with thick ridges down each face; whole surface dull and rough; pappus longer than the seed, pure white and silky. The distribution of the seeds should be prevented as far as possible by keeping the plants cut in waste places.

Eradication.—Ploughing in late June, followed by cultivation, thus preventing leaves forming.

Prickly Lettuce or Compass Plant (*Lactuca scariola* L., var. *integrata* Gren. & Godr.), introduced from Europe, is annual or occasionally winter



annual. It is widely distributed in waste places from Nova Scotia to the Prairie Provinces and reported from parts of British Columbia; sometimes giving trouble in fields. A coarse, tall-stemmed plant, averaging 3 to 5 feet in height. The leaves are oblong-lance-shaped margined with spines and prickly on the midrib beneath, only the lower ones more or less pinnatifid, stalkless, with ear-like lobes at the base. The leaves of the stem are twisted at the clasping base so as to stand vertically with the edge to the sun, instead of horizontally, as in the case of the leaves of most plants. This peculiarity has given rise to a common name of this lettuce, the Compass Plant. The flower heads are pale yellow, less than half an inch across, on a large



wide-spreading panicle, only a few open at a time. The seed is about $\frac{1}{8}$ of an inch long, dark greenish-gray, similar to that of the black-seeded varieties of the garden lettuce, usually a little smaller, and, like them, broadly lance-shaped and somewhat curved, flattened, margined and bearing five to seven narrow ridges down each face; whole surface roughened with fine wrinkles, and short, white bristles on the ridges near the apex.

Eradication.—Clean and seed waste places to grass followed by close cutting of this weed.

Orange Hawkweed or Devil's Paint-brush (*Hieracium aurantiacum*, L.), introduced from Europe, is abundant and troublesome in the upland pastures of the Eastern Townships of Quebec and in some places in New Brunswick and Prince Edward Island; reported occasionally from Ontario and all the eastern provinces. It is a vigorous grower which spreads rapidly by its runners and seeds and soon overruns land that cannot be ploughed, the abundant



and useless foliage displacing grass and ruining meadows and pastures. Perennial, low-growing, throwing out many creeping branches close to the ground. Filled with bitter milky sap. Whole plant very hairy. Flowering stems 1 to 2 feet, erect and simple, almost leafless. The fiery orange red of the flowers is very striking. Leaves long, rounded at the top, gradually narrowing towards the base. The seed is

from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch long; purplish-black, unripe seed deep red; strongly 10-ribbed lengthwise. The seeds are spread by the wind and are seldom if ever found in crop seeds.



Eradication.—Plough shallow after hay crop, and summer-fallow for balance of year. Avoid grass crop until completely exterminated. Rocky pastures may be improved by sowing seed of more vigorous grasses as brome grass.

King Devil (*Hieracium praealtum* Gochnat var. *decipiens* Koch.), introduced from Europe, is another Hawkweed which occurs in the eastern provinces and is abundant in southwestern New Brunswick, where it is a pest in pasture lands and old meadows. It is a pernicious weed in pastures, being perennial, with the general characteristics of the hawkweeds. It bears a few leaves, nearly all at the base, and numerous slender leafy branches running on the surface of the ground. The whole plant is sparsely hairy and lightly covered with a fine bloom. Basal leaves narrow, the long flower stalk bristly hairy, supporting a spreading corymb of yellow flowers. The seed is similar to that of the other varieties of hawkweed, a little smaller, black.



Most of our hawkweeds are of relatively recent introduction and many varieties have not yet been exactly located and described. Their identity may occasionally prove difficult, as there seems to be variations in the characters of some varieties.

Eradication.—The method of eradication is the same for all and consists mainly of a short rotation, with seeding down to clover and grass at short intervals. The seeds of the different varieties are practically indistinguishable. They sometimes occur in grass seeds and are a dangerous impurity.

Ergot on Couch, Rye and Timothy (*Claviceps purpurea* (Fr.) Tul.)—There are often found among grains of rye, rarely among those of wheat, and abundantly among the seeds of some grasses, blackish or purplish solid bodies, commonly called ergot. Fresh specimens are of a waxy or oily consistency, purplish white inside. They are the storage organs or resting stage of a parasitic fungus belonging to the genus *Claviceps*. Ergot grains vary in size and form, according to the species of grain or other grasses on which they develop. Each of these solid bodies is called a sclerotium (plural sclerotia), derived from a Greek work skleros, hard or dry, in allusion to their nature. They are a part of the vegetative system, the "spawn" of the fungus, in a resting condition, but capable of growth in the spring under such favourable conditions of warmth and moisture as they get when sown with crop seed, or when lying on the ground at the bases of the stems on which they were formed the previous summer. In the spring small toadstool-like bodies, on violet stalks, with round orange-coloured heads, about the size of



mustard seed, are produced from the sclerotia lying on the ground. These develop enormous numbers of microscopically small spores (organs analogous to the seeds of higher plants), at the time when grasses and grains are in flower. The minute spores, carried by currents of air or by insects, lodge in the flowers of the grasses and grow; in a short time they completely destroy the seed and form from them the horn-like sclerotia. During the summer spores are formed on these horns; at the same time appears a sugary secretion very attractive to insects, which carry off on their bodies many of the summer spores to the flower-

ing heads of other grasses and thus spread the infection. Late in the summer the production of spores stops, and the sclerotia or storage organs begin to lay up a kind of starch found only in fungi and known as fungus starch, as well as oils, to serve as food for the growth of the fruiting organs to be sent out the following spring. They then harden up, turn dark purple, and fall to the ground or are carried away with the grain or hay. The sclerotia occur on rye, wheat, barley and wild rice, being especially common on rye, and are also found on timothy and other cultivated and wild grasses. They all contain an alkaloid and other violent poisons. Those produced on cereals are usually broken when found in the grain. Some are used in medicine under the name of ergot of rye. Bread made from flour containing ergot may cause a disease known as ergotism; and animals which feed on grain or hay containing ergot may also be severely poisoned, as is sometimes the case on our western plains. Abortion is one well known result of cows feeding on ergotized grain. Hay containing much ergot should not be fed. Ergotized grain should be thoroughly screened and the sclerotia destroyed. Seed from an ergotized crop should not be used if any other can be procured.

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PUBLICATIONS ON WEEDS AND WEED SEEDS

The following publications of the Department of Agriculture relating to weeds and weed seeds are available on application to the Publications Branch, Department of Agriculture, Ottawa:—

Seed Control Act with Regulations.

Weed, Ribgrass.....	S. B. Pam. 3
Weed, Ragweed.....	S. B. Pam. 4
Weed, Night-Flowering Catchfly.....	S. B. Pam. 5
Weed, Green Foxtail.....	S. B. Pam. 6
Weed, Black Medick.....	S. B. Pam. 7
Weed, Sheep Sorrel.....	S. B. Pam. 8
Weed, Plantains.....	S. B. Pam. 9
Weed, Upright Cinquefoil.....	S. B. Pam. 10
Weeds, Do You Know Your.....	Ex. Cir. 45, E. F.

